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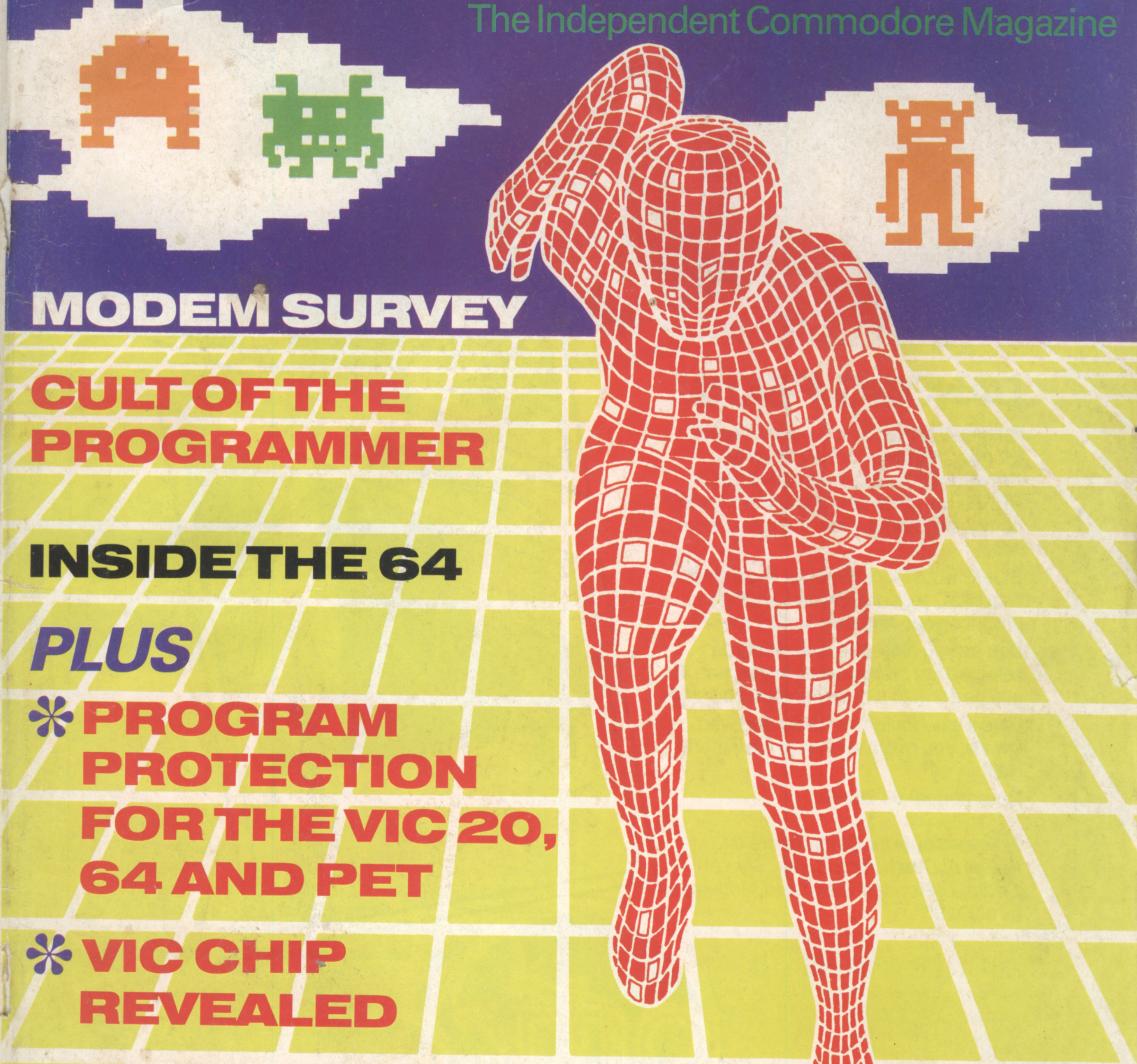
COMMODORE

COMPUTING INTERNATIONAL

The Independent Commodore Magazine



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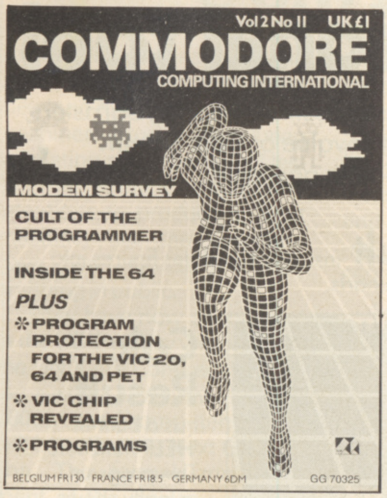
COMMODORE
COMPUTING INTERNATIONAL

APRIL 1984

COVER STORY



Ever wondered what a computer programmer is really like? Find out in our new series – Cult of the Programmers.

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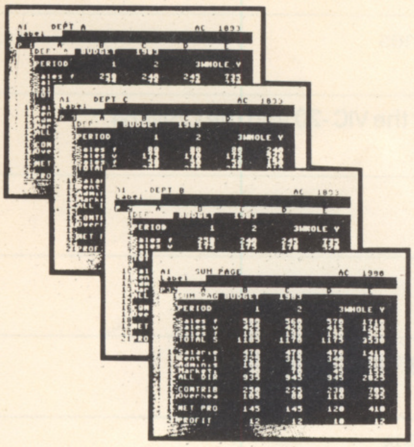

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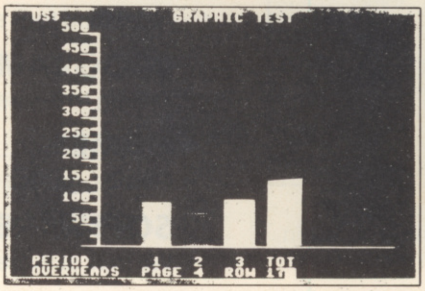

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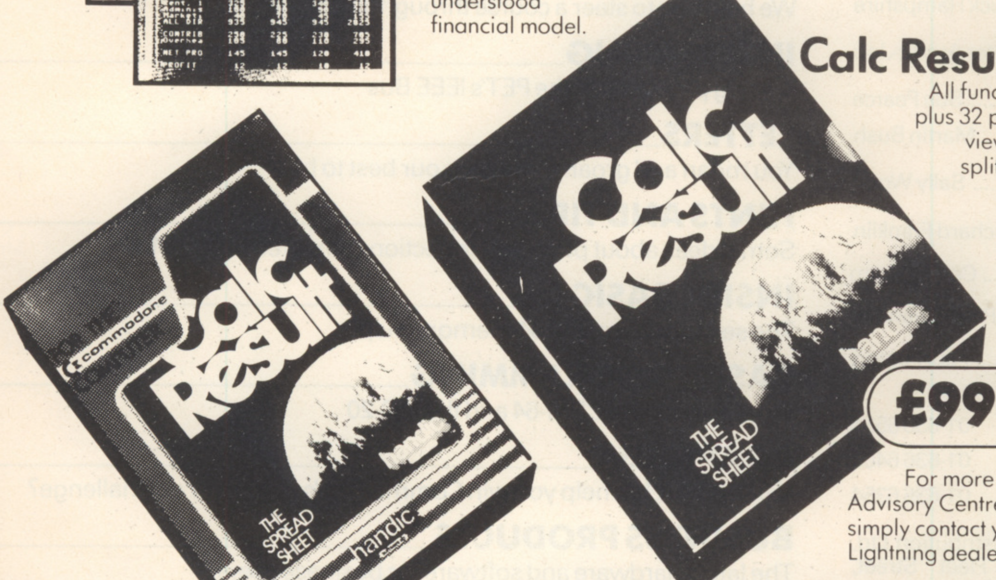

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Thinking ahead

Next Generation from Commodore

Commodore are now making public announcements about their long rumoured new 16-bit machines. Stories have been circulating since the end of last summer about Commodore's intentions to produce a 16-bit machine, but the company have been reluctant to say anything in public.

They have now announced in the US that they will be using the UNIX-like Coherent operating system in a new range of Z8000-based computers which will be called the Next Generation. The formal announcement of the new series, with 256K RAM and a single or dual floppy disk drive, is expected in May.

The Z8000 microprocessor chip is manufactured by Commodore under a license granted by manufacturers, the Zilog Corporation. All Commodore's previous computers – with the exception of the 264 and the V364, both launched only recently – have used the 6502 chip.

In the circumstances the launch of the 264 and V364 seems even more puzzling. They are based on the new 7502 chip which is an 8-bit microprocessor and it's that fact which confused many industry experts who were convinced that Commodore were about to launch a 16-bit machine.

It looks now as if the two major operating systems competing for dominance in the 16-bit market are UNIX, or UNIX-like systems such as Coherent, and CP/M 86.

Opinion at the moment seems to be swinging in favour of UNIX and many experts expect UNIX to become the predominant operating system in years to come.

Commodore look to be planning a similar marketing policy for their Next Generation. So far all they have said is that the price will be lower than any comparable system. But that alone is enough to convince many in the industry that Commodore intend to produce an upmarket machine at a middle market price.

Royalty

Commodore Business Machines (UK) Ltd have become the first manufacturing company to be granted the Royal Warrant of Appointment by Her Majesty the Queen for computer business systems.

The Warrant has been effective since 1st January 1984 and carries the legend "By appointment to Her Majesty the Queen", manufacturers of Computer Business Machines (UK) Limited Slough" and it will last for an initial period of ten years.

Commodore's Corby factory produces over 5,000 microcomputers a day. The company employs over 300 people and when they open the European manufacturing and distribution headquarters at Corby, nearly 1000 jobs will be created.

5th International Commodore show

The 5th International Commodore Computer Show is to be held at the Novotel London, Hammersmith (formerly the Cunard International Hotel) from the 7th to the 9th June 1984.

The show is an ideal opportunity for all Commodore owners to see the latest Commodore products on display. The portable SX-64 (which just lately has been the subject of so many articles it must be on par with Princess Di) will be featured as well as the even newer 264. Features of the 264 include 121 colours, inbuilt software and a full travel keyboard. It will be one of the main attractions of the show.

Over 400 exhibitors from Britain, Europe and the USA will be there, demonstrating the latest range of business, educational, leisure software packages an of course the most recent peripherals for the VIC 20, CBM 64 and the SX-64.

Vicsoft will be demonstrating its full range of educational software including the Teach and Test series. Commodore approved product suppliers will be demonstrating their business software for use on the CBM 64, the 700 and 8000 series. More specifically there is a section for CBM 64 owners which will be demonstrating the current business and home management application software.

Commodore's aim is to appeal to the whole family and a program of special events is being arranged. Well-known TV and radio personalities will be attending, competitions will be arranged and similar extra attractions are promised.

Contact: Granard Communications, 4 Babmaes Street, London SW1Y 6HD. Tel: 01-930 6711.

High street price war

Last year, Commodore caused some discontent in the home computer market when they reduced the price of the CBM 64 from £345 to £230. During summer '83 this was reported at the Office of Fair Trading for alleged price-fixing, contrary to the 1976 Resale Prices Act.

Michael Mehdi, a former banker now running Crestmatt in London's Regent Street is currently selling about 400 CBM 64's a month. His price for the CBM 64 is £184.95, which quite considerably undercuts the High Street retail price of £199.95. The recommended retail price is actually £229.95. Crestmatt's marketing policy has angered Commodore and they are now refusing to supply his company with CBM 64's.

In comparison to most competitive marketing policies, Medhi is only doing what any other merchant would do – compete with other traders by offering the lowest possible price. However, Commodore do not agree and Mehdi is currently consulting his solicitors on the matter.

Mehdi stressed that they are not involved with price matching and will not go lower then £184.95 even if some one claimed that they could get the machine for a lower price elsewhere.

It has been reported that Mehdi gets his 64 plus cassette unit for £168, but he was not prepared to confirm this, although he did say that his bank manager was fairly happy about the situation.

Will Commodore force him to up his price to what they consider to be a suitable retail price or will Mehdi maintain the right to quote a price, satisfying both the customer and his bank manager?

Computer art competition

Anyone nursing ambitions of becoming a famous computer artist will be interested in the Commodore Computer Art challenge. Besides the prizes worth £150,000, the successful competitors will win a two-month scholarship worth £5,000 to continue studies in computer art. Exhibitions of the finished work will be shown in major cities across the world, with the Commodore show being the first venue for exhibiting prize winning entries.

All you have to do is create a picture or screen image. There are two categories – still picture or dynamic graphics of not more than 60-seconds duration. The entries can be either representational or abstract.

Three age groups will be judged: under 12 years, 12-17 years and 18 years and over. All work submitted must be generated on either the CBM 64 or VIC-20 and must be capable of being displayed on Commodore computers. The closing date is 1st June 1984. All entries must be on floppy disk or cassette tape. Winners may be asked to demonstrate their skill on Commodore equipment and explain their methods and the development of their entry.

Professor Brian Allison of Granard Communications, artist Tony Hart and John Baxter of Commodore (UK) are among the judges of the competition. Qualities they will be looking for include imagination, originality, technical expertise and success in communicating the title of the work.

The first prize is the SX-64 with £1,500 worth of software and hardware including a colour printer/plotter and a Commodore monitor. The second prize is the SX-64 plus software worth £1,000 and the third prize is the Commodore 1526 printer, a monitor, two joysticks and £700 worth of software. The results will be announced in the August edition of this magazine.

Think you can do it? For your entry forms send a s.a.e. to C.I.A.A.C., Granard Communications, 4 Babmaes Street, London SW1Y 6HD.

Insurance scare

People with home computers and expensive software may not be covered under the terms of an ordinary household policy – that was the message disclosed in the third annual report of the Insurance Ombudsman Bureau.

Home computers may occasionally be regarded as commercial equipment and therefore are not covered by the average household policy. Check your policy. Also, if software and peripherals cost significant amounts, make sure that they are insured adequately as part of household contents.

If you are putting your computer to a profitable use – designing and selling software programs for instance, check if you should be insured under a commercial policy.

New HQ

Melbourne House, the publishers of books and games have moved to larger premises to accommodate the company's expansion.

Contact: Melbourne House (Publishers) Ltd, Castle Yard House, Castle Yard, Richmond. Tel: 01-940 6064.

Doubled

During 1983 the number of people with a home computer has more than doubled, according to survey report out this February.

The report, based on a survey carried out by Gowling Marketing Services, established that in January 1984, 11% of households owned computers compared with 4.9% in the same month last year.

Commodore is one of the top six models listed in the report and together with the other five accounts for 87% of the micros now in use.

Market growth of the computer industry exceeded expectations and prospects are bright for the software market where arcade and adventure games look set to take 70% of total software sales.

Copies of report can be obtained from Gowling Marketing Services, Britannia Buildings, Fenwick Street, Liverpool.

Veto angers G.O.S.H.

The action of the Ministry of Defence in seizing a new anti-copying system has angered G.O.S.H. (The Guild of Software Houses), who are currently devising ways of combating software piracy.

The system was devised by JLC Data Systems. According to Nick Alexander of Virgin, "no-one has been able to develop a protective system that works." He said that "because of the Ministry of Defence's action it is not possible for us to examine the JLC Data System, but the very fact that the Ministry have embargoed it with a secrecy order seems to indicate that is should be taken very seriously."

However, Findfree, a new London based company, claim to have developed a copyproof system and will soon be offering a protection service for disk based on the Commodore machines. They are in the process of developing the dongle and hope to market the product in a few months time.

In addition they are working hard to keep the price under £2.

Contact: D. Tuttle, 46 Oxford Street, London W1N 9FJ.

Summer show season

It's show time again as news reaches us of five approaching computer shows. There's Commodore's own show, of course, held on June 7 – 9. But before that date is the Manchester Home Computer Show to be held in Manchester's New Century Hall on April 5 – 7. Specialising in home computers, it will include the latest hardware and software.

There are two shows being held over the Easter weekend. The London Computer Show – April 19, 21 and 23 – is at the Central Hall, Westminster, London. Attractions include a robotic conference display and a computers in education display.

Profits of the fair go to support the Association of London Computer Clubs which is sponsoring the event.

Contact: T Collins, Computer Marketplace (Exhibition) Ltd, 20 Orange Street, London WC2H 7ED. Tel: 01-930 1612.

Also being held over the Easter Weekend is the Personal Computer Games Show – April 20, 21 and 22.

Radio One's annual 'Music Marathon' is also being staged at this show. A live broadcast will be attended by DJ's and rock superstars.

Contact: Solihull Conference Centre, Solihull, West Midlands.

Finally, the West Kent Amateur Radio Society are holding a Radio and Electronics Fair at the Royal Victoria Hall in Southborough on July 21.

Contact: D Green, 13 Culveren Down, Tunbridge Wells, Kent. Tel: 0892 28275.

Commodore International Computer Art Challenge.

£150,000 in prizes to be won!

The Challenge. Commodore Computers are pleased to announce their first International Computer Art Challenge, and invite entrants to submit their work for judging by June 1st, 1984.

Entries for this important new competition must be generated on Commodore 64 or Vic 20 computers, and may consist of either a still picture or of dynamic graphics of no more than 60 seconds duration.

There are three age categories: under 12; 12 to 17; and 18 years or over. All entrants must be able to demonstrate their skill on Commodore equipment and explain their methods and development of their entry if required to do so by the panel of judges.

Prizes in each of the 3 age groups and the 4 entry classifications (explained in the leaflet) are as follows:

1st Prize. £1,500 worth of Commodore equipment to the winner's choice.

2nd Prize. £1,000 worth of Commodore equipment.

3rd Prize. £700 worth of Commodore equipment.

In addition, winners will have the opportunity to see their work in a series of unique exhibitions across the world, and a special scholarship worth £5,000 will be awarded to one winner in each participating country to further his or her art education.

All entrants will receive a certificate of entry. There are no cash alternatives to any of these prizes.

How to enter. Leaflets with full details of the Challenge and the entry form are available at Commodore dealers, Commodore User Clubs, most major retail computer shops and at stores with a computer department. In case of difficulty or for additional copies, please write to:

The Commodore International Computer Art Challenge,
Granard Communications, 4 Babmaes Street, London SW1Y 6HD,
using the coupon provided.

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Please rush me a leaflet and entry form for The Commodore International Computer Art Challenge.

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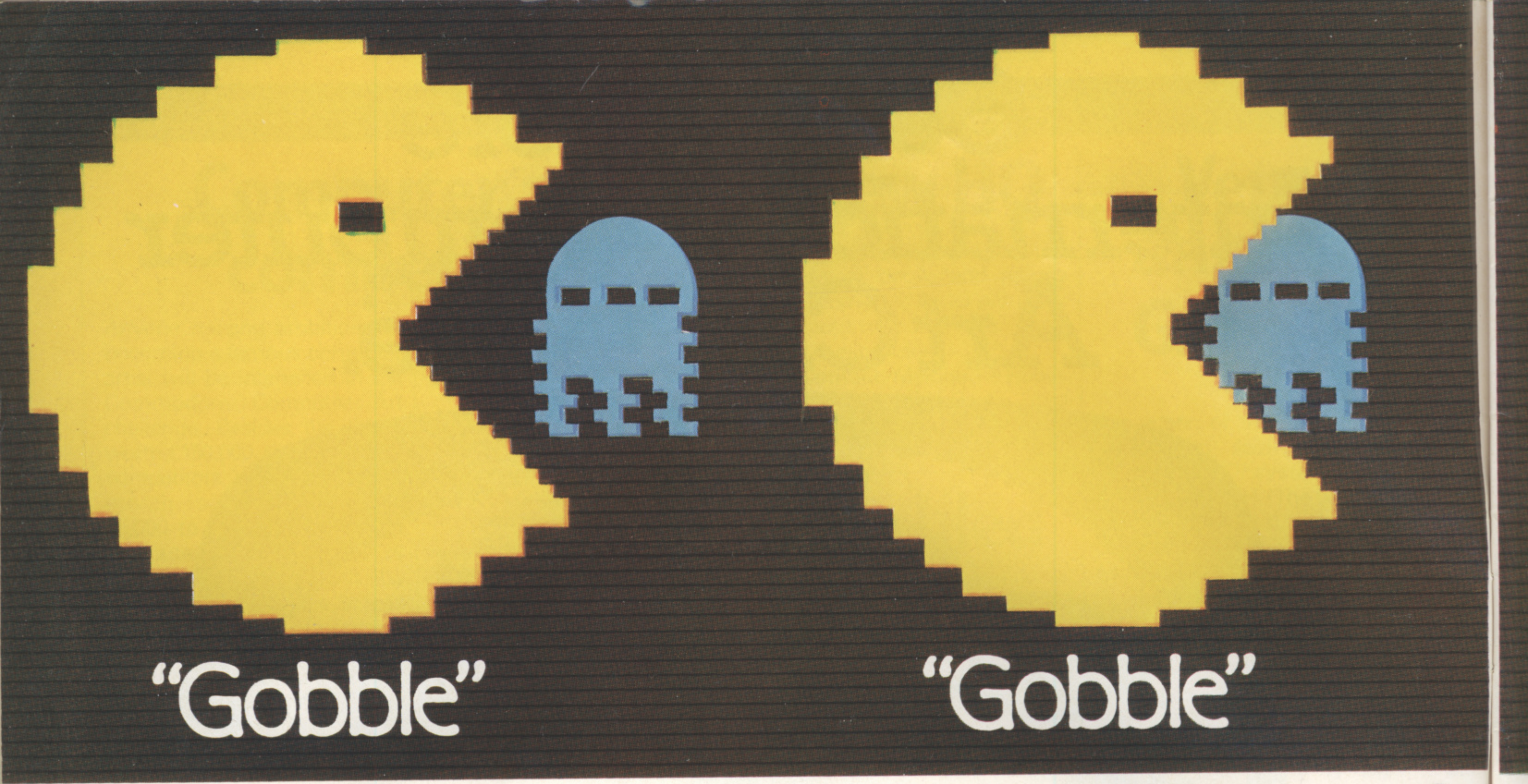

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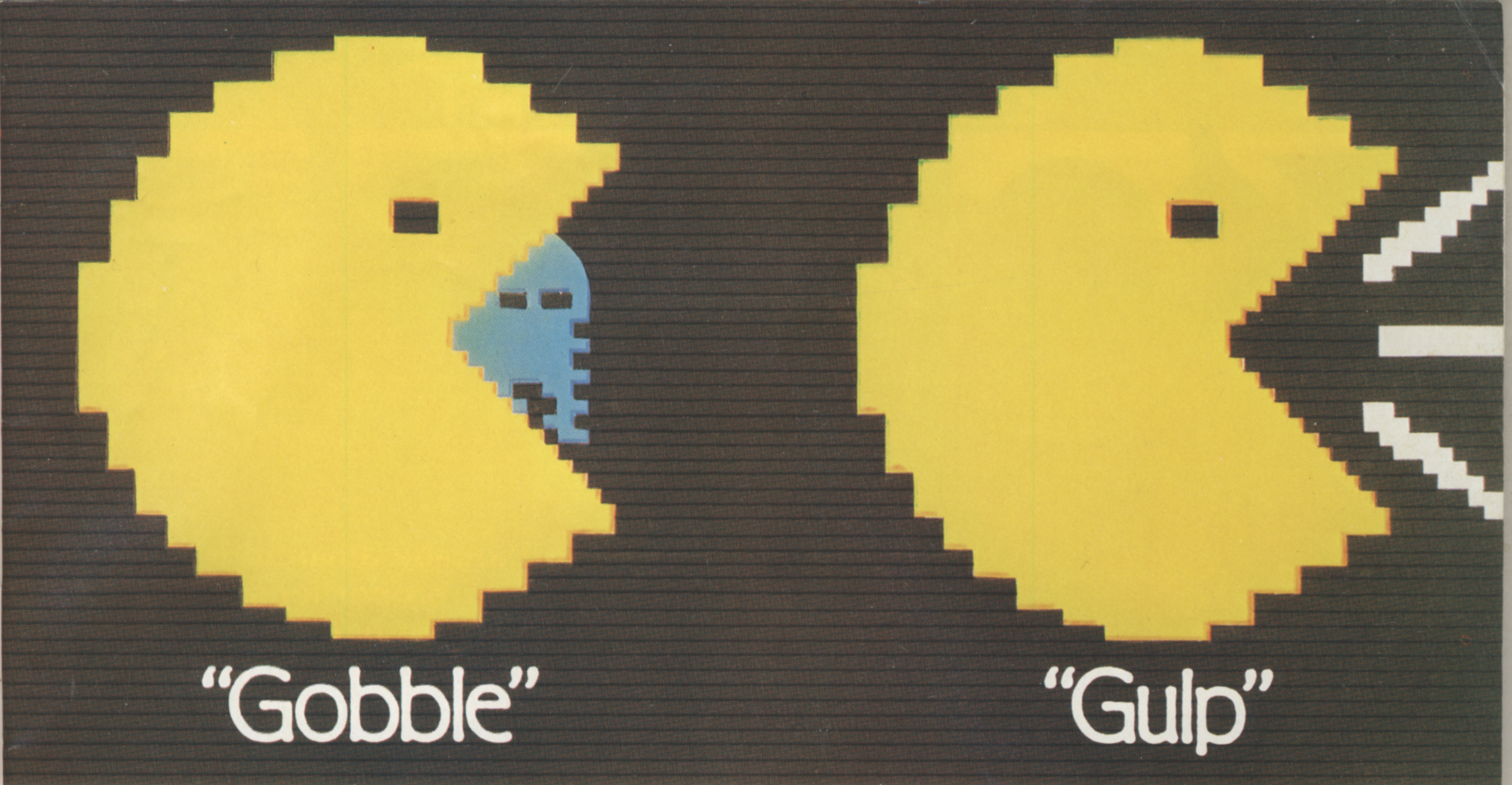
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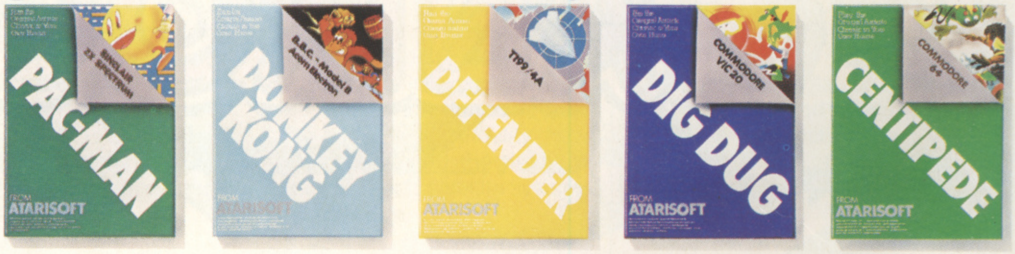
Look at our extensive range of titles. We will be adding to this list so that you can expand your library of Atari games. After all why choose a ghost now that you can have the real thing?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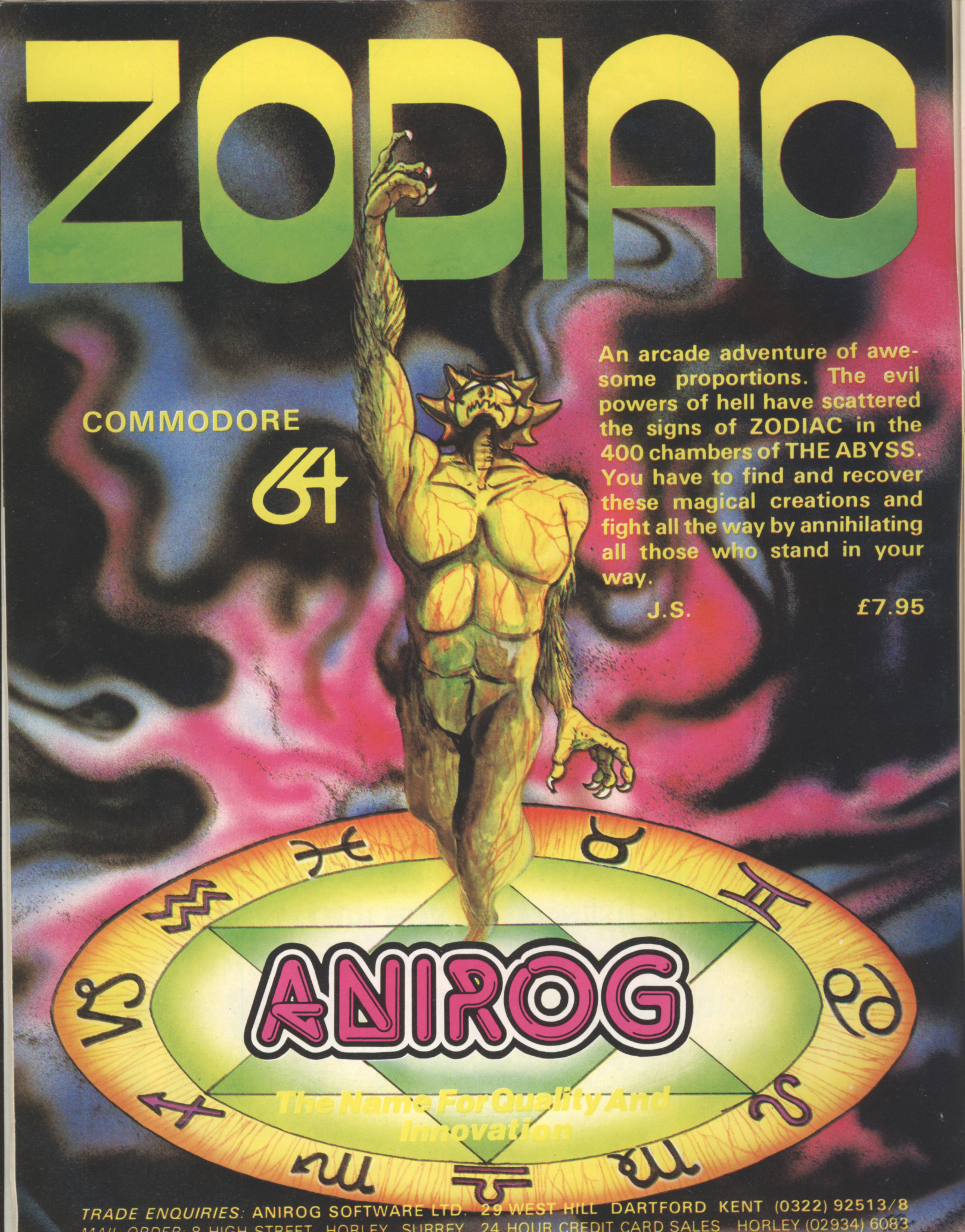
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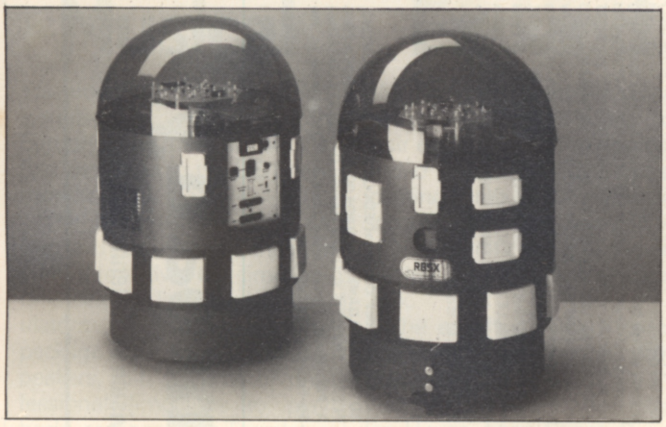

New look robot

The RB5X, the intelligent robot from the RB Robot Corporation has been given a new look corresponding to some of its new capabilities.

It is a fully programmable personal robot for home use and experimentation. Features include Polaroid Rangefinder (tm) sonar sensing, its own battery charger, circuitry and software that enables it to charge up when the batteries are low. Hardware options such as voice synthesis and a robotic arm are available.

The most important enhancement is on the interface panel. There is a socket for plugging in optional 2 or 4k pre-programmed software modules. The software is contained in an EPROM and includes a series of short programs.

The RB5X is available from selected dealers. In the US the robot retails for $1795 and upgrade kits cost $300.

Contact: RB Robot Corporation, 18301 West 10th Avenue, Suite 310, Golden, Colorado 80401. Tel: 303 279 5525.

Juggler

Chinese Juggler from Ocean Software recently won a software competition arranged by Hungarian television in Budapest. The competition must have been challenging because there are virtually no home computers in Hungary!

Because of this all the entrants had to send their ideas in story board format. To develop their ideas the entrants were loaned home computers.

Oriental-style animation and fairground hurdy-gurdy music give prize-winning Chinese Juggler the game appeal. All the music was composed by the brother of one of the programmers. The game retails at £6.90.

Contact: Ocean Software Ltd, Ralli Building, Stanley Street, Manchester. Tel: 061 832 9143.

Arcade

Arctic Computing Ltd are introducing a range of arcade games for the CBM 64. Appearing for the first time for the 64 are five games – Planet of Death, Inca Curse, Ship of Doom, Espionage Island and Golden Apple.

Lite-up

Anyone with dark nooks and crannies in their Commodore equipment need no longer worry, as Inmac have produced a torch with a 12-inch flexible cord. It bends in any direction – even round corners – and costs £19.

The flex-lite is made of solid anodised aluminium and has a pocket clip. It is powered by penlight batteries.

Contact: Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Games

Audiogenic have launched a new range of disk based games for the CBM 64 and new SX-64. The five games – Frantic Freddie, Pegasus, Forbidden Forest, Aztec Challenge and Slinky all retail at £12.95.

They involve play on a number of different levels and the player has to successfully complete the first level before being allowed to progress any further. They are not easy and Audiogenic are providing a counselling service. Players reaching levels not covered in the manual should contact Audiogenic so that any experience of higher levels can be kept on file for reference.

Contact: Audiogenic Ltd., PO Box 88, Reading, Berks.

Rack unit

The new AVS 1600 from Fidelity is billed 'to fit the needs of the modern family'. It is a rack system integrating a 16-inch colour television with an audio system.

Incoporated into the unit is a 3 waveband tuner, record player, stereo cassette deck, 24 watt amplifier and 2 speakers.

The monitor socket at the back accommodates the CBM 64 and VIC-20. Fidelity have also considered the needs of the cable and satellite systems of the future.

It costs £400 and will be available from leading stores and electrical retailers.

Club

Cyber Robotics have developed a user club which will keep all buyers and users of their robots informed of new application software as it becomes available. Cyber are currently developing software that will make the computer and robot into a complete educational program.

Contact: Cyber Robotics Ltd., 61 Ditton Park, Cambridge. Tel: 0223 210675.

64 talks

Adman Electronics have launched a speech synthesiser for the 64 with the backing of a number of software companies. The first compatible title released is Bug-Byte's Twin Kingdom Valley, a game featuring 175 screens using hi-res graphics and sprites. Speech has now been added to the game and all text appearing on the screen is 'spoken' by Adman's speech synthesiser.

Other companies releasing compatible software include Voyager and Crystal.

Retailing at £49.95, the speech synthesiser uses the allophone construction of words. As each key is pressed it is voiced.

Contact: Adman Electronics, Ripon Way, Ripon Road, Harrogate, North Yorkshire HG1 2AU. Telephone: 0423 62642.

Cabinet

Marcol Cabinets have designed a home computer cabinet to hold a CMB 64 or VIC 20. There is plenty of space for storing peripherals and software.

Supplied as a flat pack for £79.95 inc VAT and delivery, it has a teak effect finish. A deluxe version in polished wood and brass fittings is available for £180.

Contact: Marcol Cabinets, 8 Bugle Street, Southampton. Tel: 0703 731168.

64 hardware

These prices include VAT and carriage! If software is ordered at the same time a further discount on hardware of 1% is offered for each £30 software bought (limit is 5% extra discount). For example, ordering £150 or more of software at the same time as special package (j) reduces its price by £11.50 to £218.50. Applies to hardware listed here only. Note we cannot guarantee to supply any product of Commodore's.

Product	*OUR PRICE*	Product	*OUR PRICE*	Product	*OUR PRICE*
(a) Commodore 64	£195	(f) 1526 printer	£310	(j) package (a) + (b)	£230
(b) 1530 cassette unit	£ 40	(g) Epson FX80	£400	(k) package (a) + (c)	£390
(c) 1541 disk unit	£199	(h) parallel printer cable + software	£ 25	(j) Interface to convert any cassette recorder for 64 use – it's excellent!	£ 25
(d) 1701 monitor	£210	(i) SX64 portable	£850		
(e) MS801 printer	£199				

For customers having difficulty obtaining copies of **COMPUTE!** and **COMPUTE GAZETTE**, we can supply these on subscription at £2.20 per copy which includes postage. We can also supply any book at normal retail price plus £1 p&p.

VISA

Access

ACCESS/VISA credit card hot-line:

(0227) 266289

If answering machine is in use be prepared to state program name, your credit card number and expiry date, your address and telephone number.

software selection

This is a selection of some of the best programs for the Commodore 64 from a list of over 800 we can supply, covering the products of 100+ software houses from the UK, rest of Europe and the USA. A 20-page listing and later updates are available free to customers (otherwise 50p and large SAE. Add 50p p&p for orders under £20. (Europe £1 all orders).

Please note that the prefix (d) before a price denotes that the program is available on disk (for example d25). The prefix (r) (as in r29) indicates that the program is in cartridge form and costs £29.00. Tape program prices have no prefix. Thus (d29) indicates a disk version at £29.00 and a tape version at £16.00.

WORD PROCESSING

PAPERCLIP (d90) is the most sophisticated and versatile wp program for the 64. Very good too is **VIZAWRITE** (r78 d65) which also has a spell-check program **VIZASPELL** (d20 if bought with VIZAWRITE, else d65). But for casual wordprocessing of extreme sophistication we recommend **HOMEWORD** (d35) which is outstanding value and very easy to master. It uses 'icons' to symbolize menu options (as used by Lisa). Contains several really innovative features. Much further down the scale but ideal as a low cost text editor is **WORD WIZARD** (5.99). Compatible labelling programs are available.

UTILITIES

DISKEY (d36) is a really powerful disk editor which enables you to manipulate fully your 1541 and files produced on it. **PROGRAMMER'S UTILITIES** (d14.99) surely represents the best value if you have a disk: sprite, character, and sound editors are provided in addition to a PET emulator, and disk copy utilities – a dozen in all! **COMPACTOR** (d10.50 8.50) cuts out all wasteful programming including REMs and spaces. This can speed up programs and salvage memory. Various good quality sprite and character editors are available including **SUPERFONT 4.0** (6.75) **SPRITE/GRAPHICS EDITOR** (5.99) **SPRITEMAKER 64** (6.75). On the music side there's **MUSIC COMPOSER** (r9.99) **ULTISYNTH** (14.95) and **SYNTHESOUND** (r25 d25).

PROGRAMMING AIDS

These range from improvements to C64 BASIC to actual programming aids. SIMONS BASIC (r50) adds 114 extra commands and facilities, and the rather better planned program **BC BASIC** (r50 17.95) does much the same. Best of the compilers and excellent value is **PETSPEED** (d50). On the machine code front there are numerous monitors and assemblers the best of which is **MIKRO ASSEMBLER** (r53) but **MONITOR** (r29.95) **ASSEMBLER 64** (6.75) **ASSEMBLER DEVELOPMENT** d24.95) **HESMON 64** (r29) **MASTERCODE ASSEMBLER** (14.95) can all be recommended. If you want to learn about machine code programming we suggest **ASSEMBLER TUTOR** (d29.95 29.95) or Honeyfold's **BEGINNER'S ASSEMBLY LANGUAGE PROGRAMMING** (14.95)

DATAFILES/DATABASES

Unquestionably the one program to have if you can afford it is **SUPERBASE 64** (d88) which we have on special offer by way of encouragement! This is a sophisticated programmable relational database. Think of what you would like your database program to do – and SUPERBASE will probably be able to do it! Very, very powerful and very, very versatile. **INFODISK** (d73) and **DELPHI'S ORACLE** (d90) are very similar and offer larger individual records but more restricted programming constraints. Multifunction database/wordprocessors include the excellent **MAGPIE** 64 (r95) **INFOMAST** (d90) and **VIZASTAR** (d99). All these programs are capable of serious disk-orientated business applications. **DIARY 64** (r30) is a really excellent 'single page' datafile for tape or disk records.

FINANCE & BUSINESS

CALCRESULT (d95) is a very sophisticated 3D spreadsheet we highly recommend for serious business uses. **PRACTICALC** (d40 35) is very good value. Also: **FUTURE FINANCE** (d75) and **BUSICALC 2** (d79 77). For home accounts there's **BANK MANAGER** (d10 7.50) **HOUSEHOLD FINANCE** (21) **MONEY MANAGER** (9.99) the very sophisticated **HOME ACCOUNTANT** (d52.50) **TIME & MONEY MANAGER** (d49). Business account programs are available also. These usually form part of a suite of related business programs. For a low cost example **BUSCOM-1, BUSCOM-2, BUSCOM-3** and **BUSCOM-4** are for monthly accounts, wages, retail accounts, and stock system respectively (all d21 19 – demonstration versions at d4.50 2.50 each). Expensive and sophisticated alternatives are also available. For VAT record-keeping and a full audit trail we unreservedly recommend **MICRO SIMPLEX 64** (d175). A very professional program with full product support. Suits Schemes A to F. Demo available against deposit.

RECREATIONAL

We can supply any of the popular games from established software houses and this includes an unbeatable selection of imported material. If there's a program for the 64 ... we can usually provide it! Look out for ALICE IN WONDERLAND (d27) and the definitive C64 **FLIGHT SIMULATOR II** (d35). Really good imports include **BLUE MAX** (d29 29) which has truly outstanding graphics and diagonal scrolling like **ZAXXON** (d29 29) which should be available soon. There's also **PROTECTOR II** (d25 25) **FORT APOCALYPSE** (d23 23) **PITSTOP** (r27.50) **JUMPMAN** (d27.50 27.50) and **JUMPMAN JUNIOR** (r27.50) ... but there are many others! Interested in adventuring? Highly recommended are the following: **COLOSSAL ADVENTURE, ADVENTURE QUEST, DUNGEON ADVENTURE, SNOWBALL, TIME LORDS** and **TWIN KINGDOM VALLEY** (all 9.50 each) **THE HOBBIT** (14.50), plus Infocom's **ZORK I/II/III, STARCROSS** (all d29 each) **WITNESS, DEADLINE, SUSPENDED, ENCHANTER, INFIDEL, PLANETFALL** (all d36 each).

Our list includes details of EDUCATIONAL, ACCOUNTING, BUSINESS and GAMES programs not possible to itemize here. PLEASE TRY US IF YOU ARE HAVING DIFFICULTY LOCATING A PROGRAM. Please make cheques/PO's payable to the Six-Four Supplies Company.

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P.O. Box 19, Whitstable, Kent CT5 1TJ. Incorporated by The D$_G$H Software Centre, Ashford, Kent (a division of T. Denne & Sons Ltd)

Musical

Waveform have just launched a music synthesis package in Europe called the Musicalc 1. It first came out in the US a few months ago.

The program turns the 64 into a three-voice synthesizer with interactive real-time sequencing, slide controls, modulators and transposers. The package also drives TV loudspeakers, hi-fi systems or professional amplifiers to play back compositions. Templates and companion disks extend the package with 1000 more combinations of tunes and sounds per disk. In the future, extras including a musical scorewriter and keyboard will be available.

Terminal

Terminal Software have released two new games – Star Commando and Plumb Crazy for the CBM 64. Both retail at £7.95. Star Commando is intended to have fast arcade-style action where attacking space people in 3D is the main aim while Plumb Crazy revolves around plumbers and water tanks.

Tidy up

For people with a messy disorganised household yearning for some sort of order, Batteries Included might have just the job – a system of modules designed to cover every aspect of record-keeping activity in the home.

The Home Organiser Series is a system of program modules and each module is designed for a particular activity. Titles include household inventory, audio/video catalogue, stamps, home banking, address book, recipes and mail list. Page formats and classifications are laid out and there are no restrictions on filing data on disks.

Contact: Batteries Included, 186 Queen Street West, Toronto, Ontario M5V 121 Canada. Tel: 416 596 1405.

Expand

SM Software have added a further expansion board to their existing one. The original added 64k to the 8032 transforming it into a 8096. With the second expansion board, the 8096 is modified and becomes a 8160 due to the additional 160k.

The expansion board costs £250 and has a one year guarantee.

Contact: SM Software, Raglan House, Long Street, Dursley. Tel: 0453 46065.

Reduce screen glare

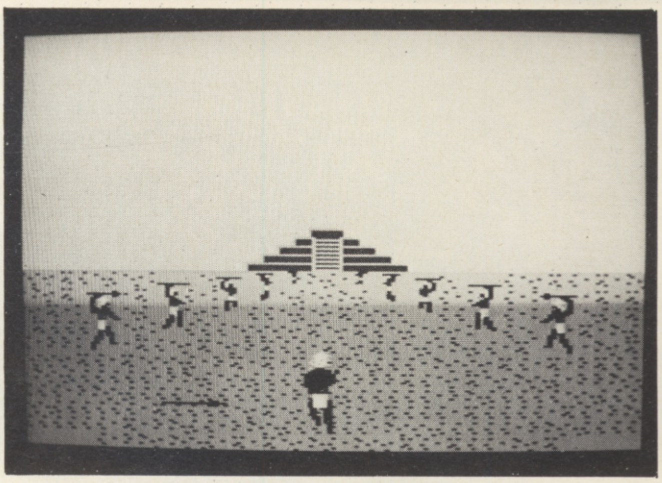
According to a nationwide survey, the glare from screen based systems has been creating health problems – backache, fatigue and eyestrain. The two causes of this are the reflected ambient light and inadequate contrast between the VDU's background and the lighted phosphor image. Two companies have introduced products to minimise this problem.

Cave Tab manufacture the polaroid CP-70, at £105, which is fitted to a Commodore VDU. It includes a self-adhesive mount which attaches to the screen surround and can be lifted off for cleaning.

Contact: Cave Tab, Tentor Road, Moulton Park, Northampton. Tel: 0604 47238.

Inmac make a filter called the Glare Sentry II. The filter is coated with an anti-reflective substance and the shatter proof glass can be fixed onto the screen using velcro fastners. They cost £95 each and come with cleaning solution and cloth.

Contact: Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.



Disk game

Audiogenic have released Aztec Challenge, a game for the CBM 64 involving warriors, human sacrifice and many ordeals in the ancient pyramid of Tenochtitlan.

There are seven levels and graphics illustrate each level. It is available on disk for £12.95 and £8.95 for tape.

Contact: Audiogenic Ltd, PO Box 88, Reading, Berks. Or Tel: 01-290 6044.

The Hulk

Incredible Hulk fans will be in for a treat this May when Adventure International launch a series of graphic adventure games featuring some of the Marvel characters. For the CBM 64, they will retail at £9.95.

The first one will feature the Incredible Hulk. The idea is that Marvel produces a comic to go with each game and the story line, left at a certain point is continued on the tape.

Adventure International of America have high hopes for the series as they think that a lot of home computer fans are also Marvel Comic fans.

Contact: 0244 313778.

Launch

Mogul Software have launched several new arcade games for the CBM 64 and VIC 20. Titles such as Labyrinth of the Creator, Mushroom Alley, Cave Kooks, Ludwig's Lemon Razors, Chomper Man and Seawolf have graphic characters like mutants, robots and insects and are intended to be full of 'fast action'.

On disk

Audiogenic have extended the Datagenic service of duplicating cassette based software to the business, technical and programming end of the market. They now duplicate disks as well as cassettes.

Contact: Audiogenic Ltd, PO Box 88, Reading, Berks. Tel: 0734 586334.

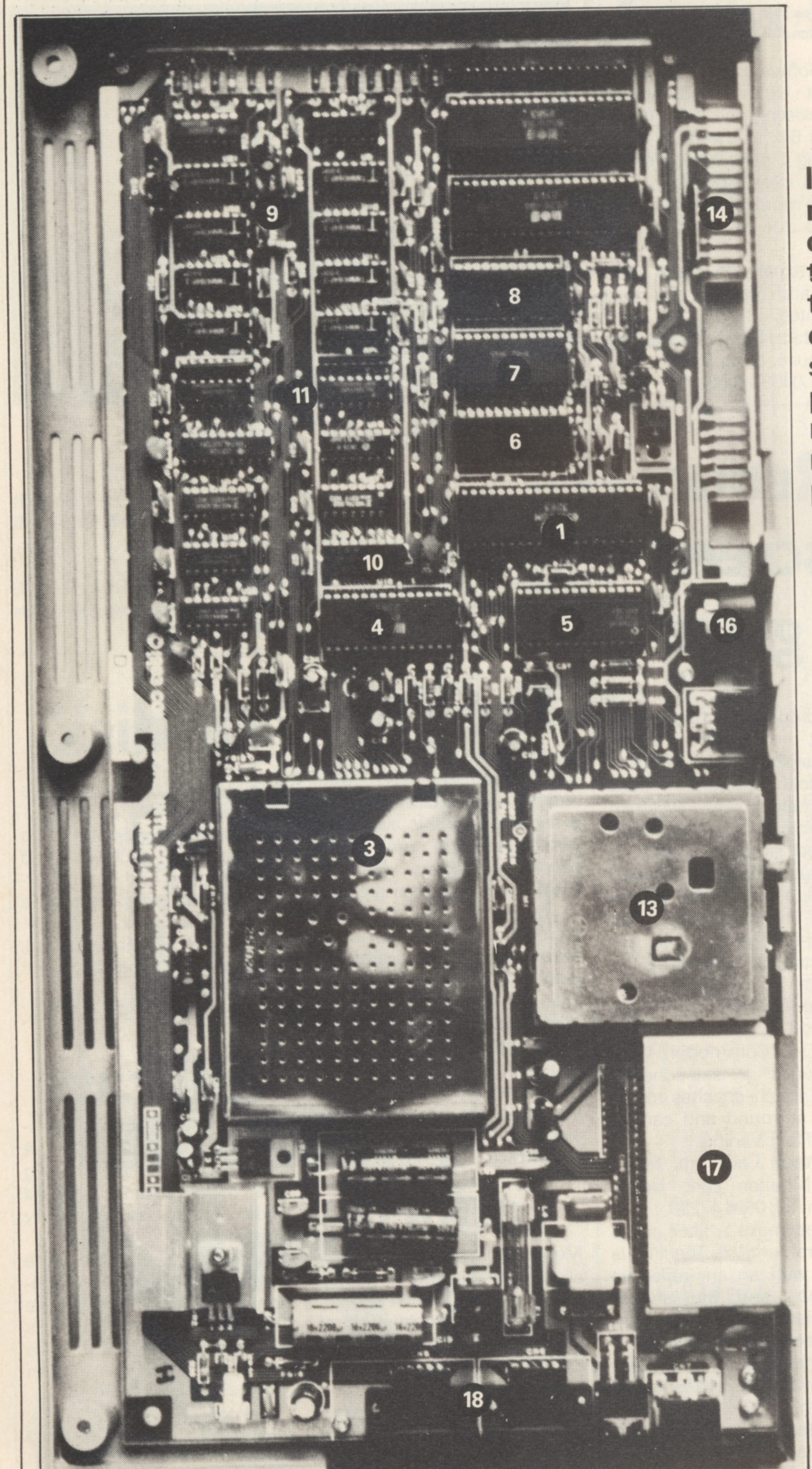
Educate

The National Magazine Company famous for Harpers & Queen and She are moving into the software business under the guise of Ebury Software.

They have established a range of early learning educational software and titles like Mr T tells the Time and Mr T's Money Box. These will be available for the CBM 64 in June 84.

Contact: Ebury Software, National Magazine House, 72 Broadwick Street, London. Tel: 01 439 7144.

Inside



Inside your computer, mounted on a printed circuit board known as the motherboard, are all the electronics for producing the specialised screen display, the sound producing circuits, the memory and all the logic needed to run the computer.

The computer's components are connected by copper tracks which connect the mounts into which the various chips are inserted. The numbers on the black and white photograph correspond to the numbers below. We explain the function of each item to give you an idea of how the computer is laid out and how it works.

① 6510 microprocessor

The heart of any microcomputer is the Central Processing Unit (CPU). The 64 has the 6510 microprocessor chip, identical in internal architecture to the MOS Technology 6502 (found in the Vic-20) to provide software compatibility.

The CPU controls the entire board and consists of three interconnected sections, the registers, the arithmetic and logic unit (ALU) and tne control section.

The registers are temporary storage units to store intermediate results, program instructions and memory addresses while they are being worked on by the microprocessor.

The ALU is the operational unit where calculations are performed and logical processes of selecting, sorting

the 64

and comparing of information takes place.

The control unit co-ordinates the various internal actions of the microprocessor using the regular electrical pulses generated by the microprocessor's clock.

② 6526 Complex Interface Adapters (CIA's)

Under the control of the CIA's are the keyboard, joysticks, user port, cassette read to the user port and outer serial port (input and output to the disk, printer and other peripherals). They also control the shift register, two internal timers (read and write), the Time of Day Clock (TOD) and generate the interrupt system, telling the main processor to go to function elsewhere.

③ 6567 Video Interface Chip (VIC)

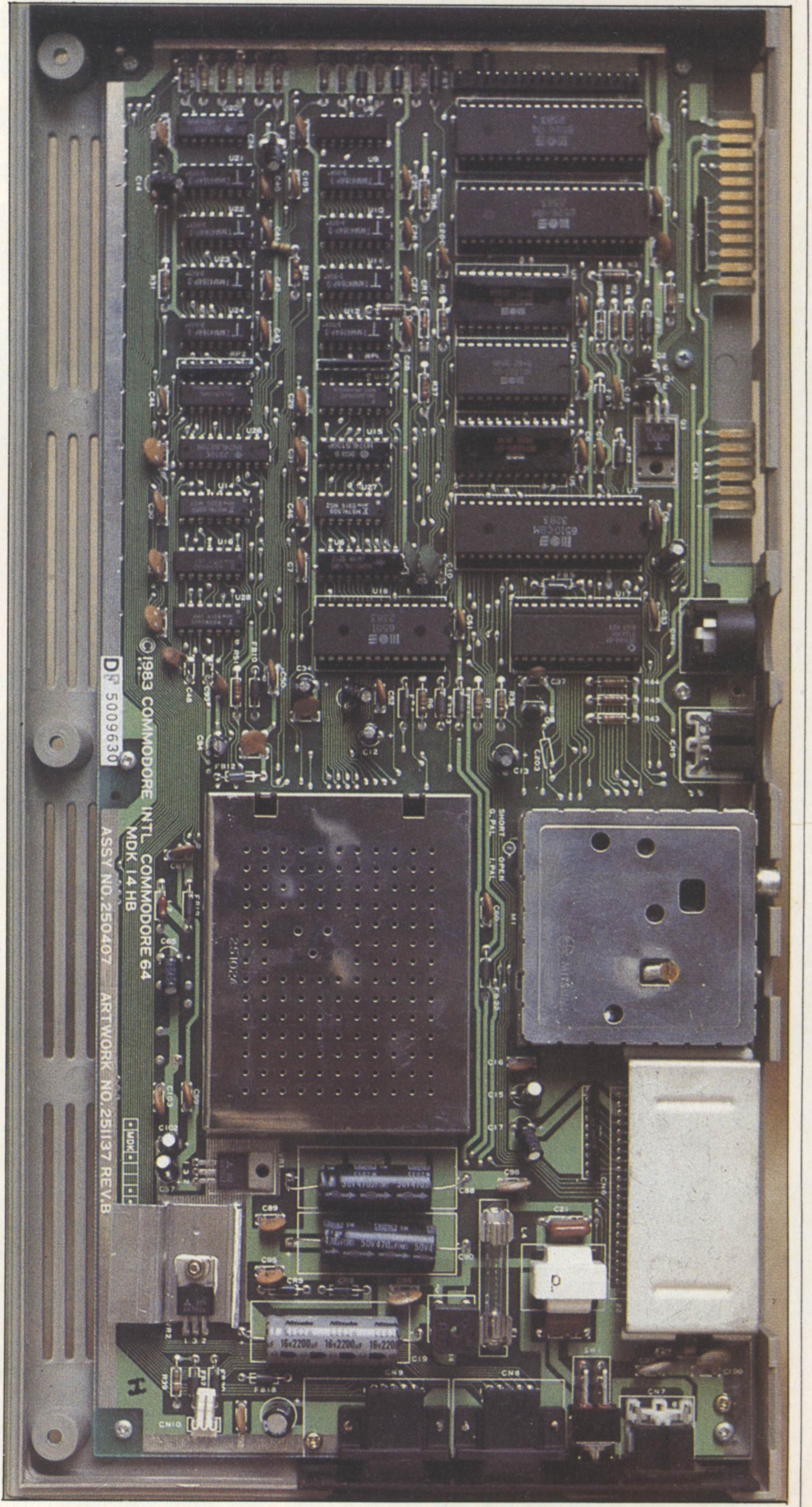
The VIC chip controls all output to the TV screen or monitor. It also controls sprites, a sprite being a high resolution programmable object used in sophisticated graphics which can be made into almost any shape and moved freely around the screen.

The VIC chip also produces an address bus similar to the processor. On occasions the VIC chip turns off the main processor and takes its place performing the video work. When this happens, the VIC chip generates addresses to the control system usually produced by the processor.

④ 6581 Sound Interface Device (SID)

SID is a single-chip, 3-voice electronic music synthesizer/sound effects generator providing wide-range, high-resolution control of frequency, harmonic content and volume. Each of its sound sources can produce four different waveforms, triangular, sawtooth, rectangular and white noise.

The frequency of each of the waveforms can be individually varied. Sound is then fed into an envelope shaper where the Sustain level and the



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Attack, Decay and Release rates can be set up. The distinctive and simulated sounds of musical instruments are the result of this envelope shape. Apart from producing sound, SID has two analogue to digital converters for connecting games paddles which have two analogue to digital converters.

⑤ Programmable Logic Array (PLA)

This holds characters for memory AC's and decides which chip is being read from.

⑥ Character Generator ROM

Data for different characters is held by this chip. The 64 has 512 characters. Each character takes up 8 bytes, so this ROM is 4K in size.

⑦ Kernal ROM

Much of the machine code routine that controls input and output from the 64 is held in the Kernal ROM. This chip also holds the main routines for BASIC commands for program storage (load, store and verify).

⑧ BASIC ROM

All the BASIC commands are stored here. The chip performs all the routines of the BASIC interpreter, reading all the commands in BASIC and enabling the computer to act on them.

⑨ RAM chips

The Commodore 64 has, as the name implies, 64K bytes of RAM. It has eight RAM chips and each one selects one bit of a byte at any memory location.

⑩ Colour RAM

This stores the colour each character position is on the screen.

⑪ Non-inverted Tri-state Buffers

Buffers are areas of computer memory for temporary storage of either input or output data. These chips support and control the RAM chips to the address bus so that the chips switch tidily in and out without interrupting other operations.

⑫ Buses

The sections of the computer are connected by groups of electrical wires called buses. Inside the micro there are three buses:

The address bus

In the 64 the address bus is 8 bits wide. It is bi-directional and carries memory addresses from the microprocessor to the memory (RAM and ROM).

The control bus

This carries the signal to either 'read' or 'write' the memory location addressed.

The data bus

This carries data back and forth between the CPU and the memory.

⑬ Modulator

The VIC chip produces a signal for a monitor and puts it on radio frequency. The modulator converts the signal produced by the VIC chip into a British TV compatible signal so that it can be displayed on a standard TV.

⑭ User port

This is an interface for non-standard devices and is used to send or receive signals under the control of the user's program.

⑮ Cassette port

The cassette motor and cassette switch sense are controlled by the cassette port.

⑯ Serial port

This controls standard peripherals such as a disk drive and printer.

⑰ Cartridge port

Sometimes referred to as the cartridge expansion port, this allows people to use software which does not have to be loaded into the computer.

⑱ Control ports 1 & 2

These control general accessories such as a light pen or a security dongle.

A more familiar view of the CBM-64

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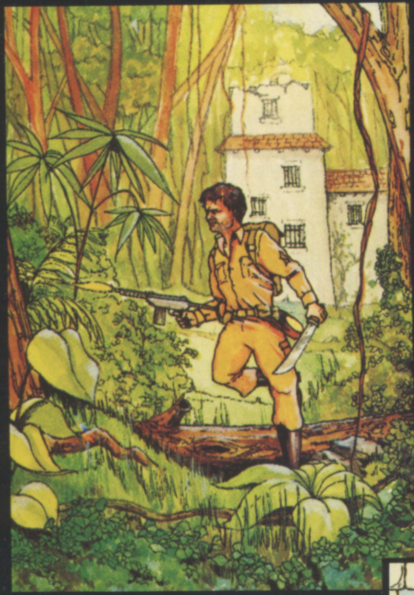

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CCI APR

The cult of '84

This month sees the beginning of a new series in Commodore Computing – Cult of the Programmer. In it we will be looking at top programmers from UK software companies – how they got where they are today and what their work involves. Here we talk to programmers from Virgin, Imagine, Galactic and Terminal, but first we look at programmers in general and provide some helpful tips for would-be programmers.

To many sprite-eyed computer freaks, the life of a programmer seems like a dream come true. An opportunity to spend all day experimenting with your computer and actually getting paid for doing it, and making a veritable fortune at that! In reality, programmers are a hard-working breed dedicating hours to their work, often foregoing a social life – sometimes even food and sleep. And none of the programmers we have spoken to have hinted at untold wealth. However, it is a job that brings much satisfaction and no programmer begrudges the long hours.

If they are not millionaires yet, programmers have achieved the added bonus of becoming personalities in their own right.

Programmers like Jeff Minter of Llamasoft have almost become household names. His name on a game pack will guarantee good sales following the success of perhaps his most popular game, Attack of the Mutant Camels. While people don't believe that every game released by a software company will be of the same high standard, they can identify with an individual programmers style of writing. If they like his way of thinking, they will probably enjoy his games.

Incidentally, if we constantly refer to programmers as being male it is because we have yet to discover a female programmer employed in writing games for a UK software company. So if you know differently please let us know.

Programmers are either employed on a full-time basis in which case they generally receive only a basic salary, or they are offered a contract to write games for a company. In this instance they usually receive a lump-sum upfront and then royalties for each game sold. The day is probably not too far off when we will see transfer deals emerging, very much like the world of football, as companies try to poach top programmers.

Once a game is accepted by a company, the copyright becomes the company's property to exploit as they consider best.

Stories of young teenagers earning small fortunes from programming games have encouraged parents to push their offspring in that direction. Parental pride blinds many to the fact that although they think little Johnnie is the best thing since sliced bread, his games are probably not up to a commercially acceptable standard.

Software companies receive prospective games from young hopefuls by the sackful. Only a few make it. So how easy is it to become a successful programmer? We asked top programmers for their advice.

One fact that emerged is that it is not considered necessary to have a computer background based on study. The general opinion is that it is better to learn on your computer than from books or lectures.

As to what makes a game successful, Galactic programmer Richard Darling (only 16 himself) advises: "In order to be successful a game should be graphically pleasant. It must be fun to play and have a lasting interest. More than one level is essential to make a person want to carry one playing.

"Sound effects are also important," continues Richard. "Try to come up with music that people will remember."

Imagine programmer, Mike Glover, confirms this and adds that up-and-coming programmers must learn and be proficient in machine code. Mike also suggests that if a programmers wants to have his work accepted by a software company, he should produce a program to demonstrate his talents. "Even a series of good routines would do the trick," says Mike.

Dedication to your program is essential. A criticism of many games is that a good idea is not followed up by attention to detail. Many programmers spend almost as long as it took them to write the game in tidying it up. What would happen if the craft spiralled to the ground when hit instead of plummeting straight down? Can the graphics be improved? Are there any bugs still in the program? Once a program is completely satisfactory, by all means approach the software companies.

Virgin Games' managing director, Nick Alexander, reveals what a software company looks for in a potentially marketable game. "Graphics are extremely important," he says. "Unless a game has immediate visual appeal it is ignored. Next comes the playability factor – whether when you finish playing a game you want to have another go. And finally it has to be different to other games already on the market. There's no mileage for us in putting out an identical game."

It looks as if the computer games market will be with us for some years yet, so we can expect the emergence of many more top programmers. In the words of Virgin programmer, Steve Lee: "If you are dedicated and stick at a game, there is no reason why you can't come up with something really good".

PROGRAMMERS

Steve Lee – Virgin

Steve Lee studied Computer Science at college and became an experienced computer operator before becoming a programmer for Virgin Games a year ago. He readily concedes that at the ripe old age of 25 he might be considered 'over the hill' by some of the teenage computing prodigies, but says: "There's a few years work left in me yet."

Becoming a programmer was always Steve's ambition. His first computer, a ZX81, was quickly replaced with a VIC-20 and then a 64. In his spare time he programmed several games which were marketed by Quicksilva. He was then taken up by Virgin Games who included Steve's Mission Mercury in their launch package.

Working from home on his 64, Steve finds himself working for up to 16 hours a day. "When I've got a good idea I spend hours working on it," he says. "Ideas suddenly come to me. I usually start with an idea for the graphics and take it from there. I always thought ants would make nice graphics and that's where the idea for Hideous Bill came from. Hopefully I will write a game with skeletons in soon."

When stuck for an idea, Steve heads off to the pub, preferably one without a games machine. "I've never been keen on video games," says Steve. "I have only ever been interested in programming them."

With experience Steve finds it is taking less time to program a new game. He explains: "With Falcon Patrol I had the ideas but it took about five months to complete. Now I've built up a stock of routines it takes less time."

Being a perfectionist where his games are concerned, Steve spends as long as it took to write the game in tidying it up and seeing if it can be improved. "Learning how to get an effect from the machine is great fun," Steve comments. "We've taken the 64 as far as it will go, although I'm sure that more can be done with the SID chip."

Like many programmers, once a game is completed Steve will never play it again. "I don't even ring Virgin to see how well it is selling," he says.

Not wishing to put all his eggs in the same basket, Steve is already considering other outlets for his programming talents. He recently programmed a sequence for a new Virgin film due for general release in the summer. Called Electric Dreams, it concerns a computer who falls in love with the woman upstairs and its subsequent battles with its user for her affections.

Steve also has plans to investigate computer graphics as a form of advertising in the future.

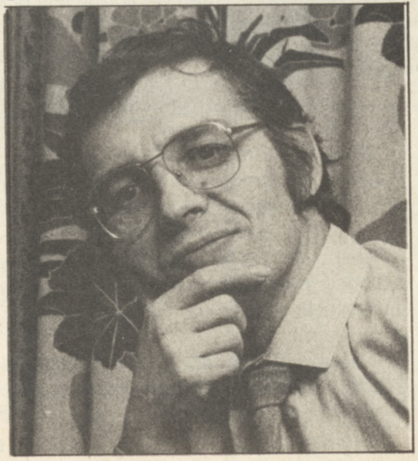
Poor Reg Stevens was laid up with a broken arm when he spoke to Commodore Computing. He insisted it was the result of a roller-skating accident, but rumour has it he forgot his parachute in Super Dogfight!

Super Dogfight is just one of the many games Reg has written for Terminal, others including Skramble, Get Lost and new release Star Commando. At 41, he admits to being "almost geriatric by games programmers standards".

Programming games is a part-time job for Reg. During the day he works as an electronic engineer, coming home to spend about 20 hours a week on his computer. Although Reg has previous experience of programming, "I dabbled in Assembly language," his VIC was originally bought as a 'play thing'.

The association with Terminal came about when Reg gave a friend (who happened to work for the company) one of his games for his own personal entertainment. Terminal decided to market it and now Reg writes many programs for the company.

"I work most days on my games," says Reg. "Once I start I have to keep going. After a two day gap I have a problem getting back to it. It's difficult to remember where you left off."



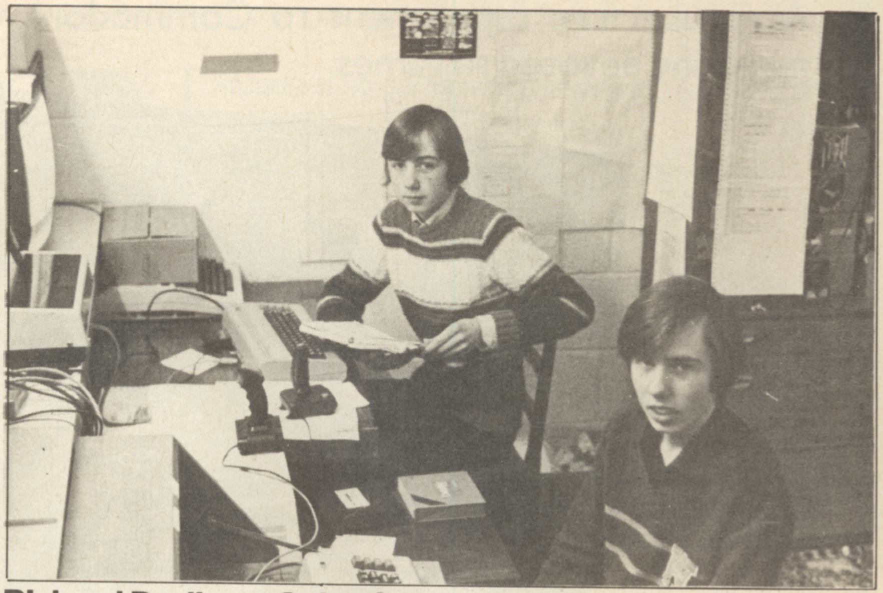
Reg Stevens – Terminal

Ideas for new games are no problem for Reg. Quite the opposite. "My problem is that I find it difficult to finish one game before I come up with an idea for a new one," he says. "I find myself chopping and changing between games all the time."

Working part time on his games, it takes Reg about three months to complete each one. "These days games are getting more sophisticated," says Reg. "At the moment we are going through a phase when graphics are very important, sometimes to the expense of the quality of the game. It's important to combine good graphics with a good game."

Reg finds that the best critics of his games are his two sons, aged 11 and 14. He comments: "I started to write the games for my sons. They now tell me where I'm going wrong! My 14-year-old is already showing signs of taking over."

PROGRAMMERS



Richard and David Darling at work

Richard Darling – Galactic

At the age of 16, Richard Darling is one of those computer whizz-kids making his mark in the computer programming world. For Richard, programming became a hobby when he acquired a VIC-20 and he was soon spending hours after school experimenting with programs together with his brother David, now 17. The two decided that their games were as good as, if not better than, any on the market. A classified ad placed in a computer magazine brought overwhelming response and so the Darling brothers formed their own software company, Galactic, just over a year ago.

Now programming is a full-time job for Richard. "We get to work at 9am, stay until 7pm when we break for dinner, then come back at 9pm and work until midnight or later," says Richard. "And that's usually seven days a week!"

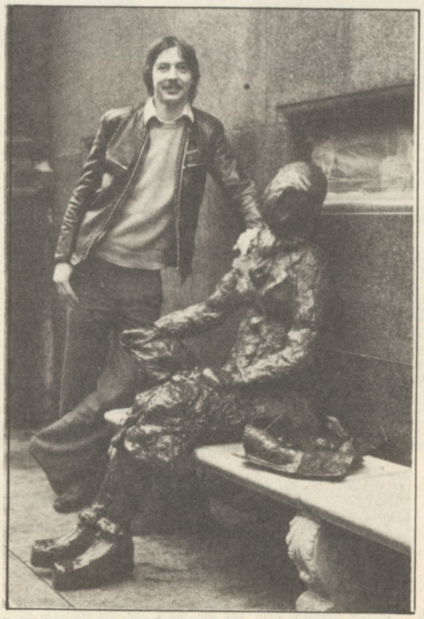
That's dedication. Despite the long hours, Richard still enjoys what he is doing and is never stuck for ideas. Usually the brothers sit down and discuss thoughts for new games, but there are occasions when an idea suddenly springs to mind. For a long time Richard had been puzzling over the possibility of a 3D maze game without using machine code. "One morning I woke up with the solution, so I leapt out of bed and tried it. It worked."

Richard explains that when they first start programming a game, they have only an idea to work on and that during writing the program more ideas occur and so the game progresses. The time taken to write a program varies according to content. Richard comments: "Something like our Games Designer for the 64 takes about four months. In doing the games designer we built up routines which we can use again. Now we can program a three-level game at the rate of one level a day."

Once a game is complete Richard does not play it again which comes as a surprise seeing as his father used to bemoan the time and money Richard spent at amusement arcades. Richard confirms this: "There aren't any amusement arcades where we are now living, but if there were I would still go. The more you look at arcade games you get a better understanding of what people want from a game."

Examples of the games the Darling brothers have written for Commodore computers include Orbitron, Sub Hunt, Bunny Zap and Bug Diver.

Looking to the future, Richard says they will continue producing games to meet public taste. "We'll be doing the sort of programs that people want like arcade games and designers, but fairly soon we will do some more serious programs such as educational."



Mike Glover – Imagine

Mike Glover, 26, wrote the game Pedro for the 64. He learnt Basic programming as a subsidiary subject at college, but like many programmers his VIC-20 was just a hobby. Mike came into contact with Imagine when the software company sponsored Palamine, the company he was then designing racing engines for. Computers cropped up in the conversation and Mike was offered a job as a programmer for Imagine.

Imagine employ an artist to draw the graphics and somebody else to write the accompanying music. It is then Mike's job to write the program.

"Ideas for games come from various people," says Mike. "Pedro was actually based on an idea we received in a competition we held. Once the idea's there, it takes a couple of months to write the program. Depending on how rushed we are to meet a deadline, that sometimes means sitting up for 24 hours a day. It's fun though so I don't mind."

Mike generally teams up with another programmer and they are now working on a new game. Without giving anything away, Mike says it is a totally original arcade game with a touch of adventure graphics andd that it will be a long game.

It was Mike who programmed the fast tape load, Injector-load, used by Imagine in their games. Mike comments: "It runs a whole new cassette operating system and loads a program in just three and a half minutes. It flashes the border colour and gives the effect of speed by appearing to scroll down the screen."

In future games, Imagine will add music while the program is loading and a loading screen.

Mike has never been a keen games player. "I have never bought a computer game," he says. "There's far more fun in writing games than in playing them. You've got to be young with fast reactions – Pac-Man is about my limit!"

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by Andromeda Software

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>
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>
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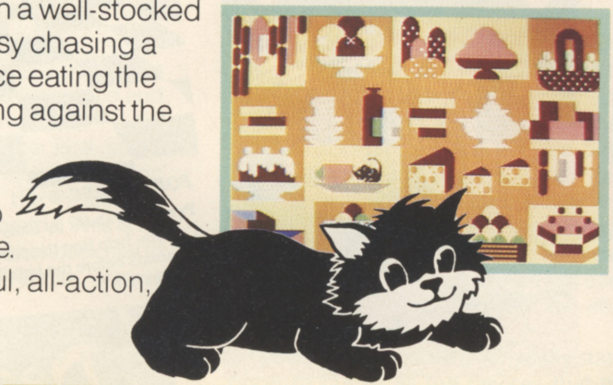

There's catchy music and a best-score record. Caesar the Cat is a challenge for high-scoring arcade addicts (has anyone reached a score of 10,000 yet?) as well as great fun for the novice.

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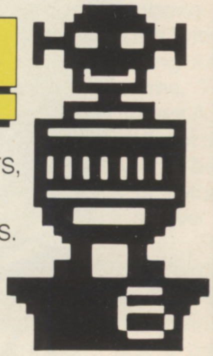

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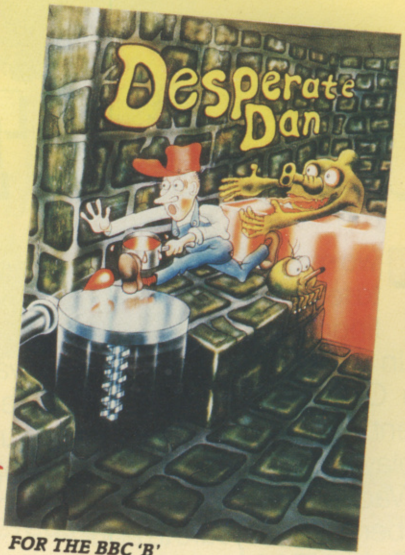

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Transylvanian twist

Characters such as Count Kreepie and Quasimodo feature in this month's selection of new games for the VIC-20 and the CBM-64 designed to test your brain power as well as your reflexes.

Hunchback

Hunchback takes the player back to the days of old when knights were bold and computers hadn't been invented.

The hero of this game is a sprite called Quasimodo and his task is to hop along the ramparts of the castle and rescue the trapped Esmerelda. This is no mean feat because the hunchback has to avoid all the knights, fireballs, arrows and fiery pits.

The initial screen is quite ingenious showing Quasimodo happily skipping along to the tune of The Teddy Bear's Picnic whilst also giving details of some of the hazards that the player will have to overcome.

In all, there are 15 different screens, each one being more difficult than the last.

Title: Hunchback
Company: Ocean Software Limited, Ralli Building, Stanley Street, Manchester M3 5FD. Telephone 061 832 7049
Type: Arcade
Graphics: Very good
Hardware required: 64, monitor, joystick (optional) and cassette recorder
Price: £6.90
CCI rating: ***

Transylvanian Tower

Dracula's cousin, Count Kreepie, comes to life in a game called Transylvanian Tower. This is an adventure game for the 64 where the player has to find the Count, kill him and grab the hidden treasure. As usual with this sort of game, it is not as easy as it sounds. There are five levels to the game and the player will not come across Count Kreepie until the last level.

At the start of the game, the player has to find his way up from the dungeons and is helped by the provision of a floor plan. Later on, such a plan can only be accessed after a bat has been killed. Apart from the Count himself, these bats are the only real danger and practically the only difference between levels three and four and level two, apart from the new maze generated for each level, is that the bats must be shot through the heart.

Level five is where the fun really starts because out of all the devices that the player has picked up and dropped on the way, only one is capable of killing the Count.

The tower itself has 500 different rooms with the player getting around using the unshifted cursor keys and the arrow keys.

Title: Transylvanian Tower
Company: Richard Shepherd Software, Elm House, 23/25 Elmshott Lane, Cippenham, Slough, Berkshire. Telephone 06286 63531
Type: Adventure
Graphics: Good
Hardware required: 64, monitor, cassette recorder
Price: £6.50
CCI rating: ***

Puzzle Pack

Puzzle Pack is one of those cassettes that contain more than one program on both sides of the cassette. The programs are often of a dubious quality and this collection is no exception.

This compilation has six programs, three on each side. As with most tapes of this sort, only a couple are any good, the rest being average or worse.

The first game is called Orbits and the player has to fit various shapes dropped from a spacecraft and fit them into the appropriately shaped landing areas.

This game is followed by Knights Move which is a little more intellectually stimulating. Here, a grid of squares has to be filled without landing on the same square more than once. This is followed by Graphic Twister where the player has to manoeuvre some graphic displays around to match a pre-set pattern.

On the other side of the tape are the remaining three games. Rainbows is not, as the title suggest, about the British weather. Instead it is about working out a series of mathematical patterns. For example, the screen display shows A, B and D and the player has to work out the next letter. This is probably the best game of the lot for its use of colour, because with each correct answer a rainbow is constructed.

This is followed by Slide Puzzles which is another game where the user has to create a pattern and finally Digits where the sole aim is to plot a path through a series of numbers and get the highest score.

At the end of each game the user is not immediately allowed access to the following game as each game has to be loaded seperately. This is only a matter of seconds and is therefore not too much of a disadvantage.

Title: Puzzle Pack
Company: Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233
Type: Arcade compilation
Graphics: Poor
Hardware required: VIC or 64, cassette recorder, monitor
Price: £6.95 for the VIC version and £7.95 for the 64 version
CCI rating: **

KICK~OFF

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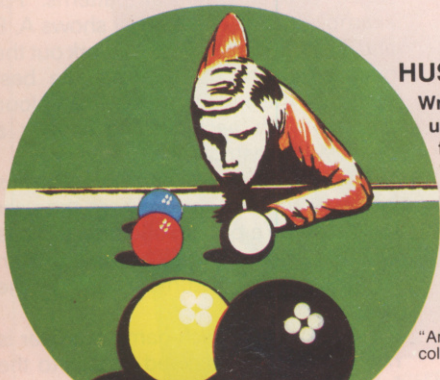
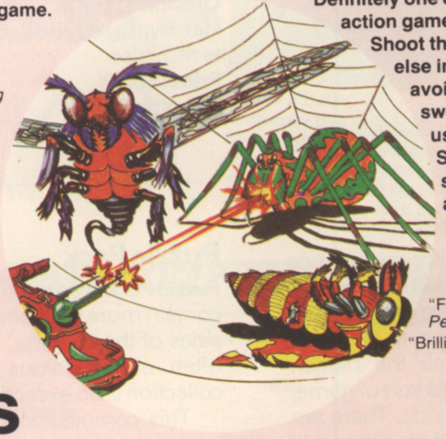


HUSTLER

Written in machine code and using Sprite graphics HUSTLER takes the 64 to its limits. There are six 'pool' type games for one or two players, high scores kept and super music. Machine code. See the great press reviews. You won't find a more realistic snooker type game.

"Another gem – a must for the collection"
Commodore Computing



EXTERMINATOR

Definitely one of the best arcade action games around for the 64. Shoot the worm and everything else in the garden whilst avoiding the deadly spider and swooping eagle. Machine code using high resolution and Sprite graphics with excellent sound. Beware, it's very addictive.

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Marathon

As the title suggests, Marathon is all about racing. Racing against time and the opponent. It is also an educational piece of software designed to run on the 64.

The screen is split in two with the lower half comprising two grids of numbers which form the selection of possible answers to questions. The selection of an answer, whether it is wrong or correct, prompts action in the top half of the screen. Here, there are two runners and the more correct answers that are entered, the greater distance the runners will cover.

The questions themselves cover the four mathematical areas of addition, multiplication, subtraction and division. There are several skill levels and as the player progresses, the time allowed to answer each question becomes shorter.

Although this is an original educational idea and the screen is very colourful, for some reason the game did not respond all that easily to the joystick.

Title: Marathon
Company: English Software, Box 43, Manchester M60 3AD. Telephone 061 835 1358
Type: Educational
Hardware required: 64, monitor, joystick, cassette recorder
Price: £9.95
CCI rating: ***

Nightmare Park

Nightmare Park is a strange mixture of an adventure-cum-arcade game for the 64 from A R Software.

The player starts off at the entrance to the park which is graphically portrayed as a maze. The object is to get to the park exit without losing the six lives. As the player progresses through the park, he is confronted by several hazards each of which may cause the player to lose a life. There are various hazards depending on the path chosen and the level of play.

In all there are 14 levels of play. Level 1 seems to consist solely of stampeding herds of cattle, whereas on other levels the player will encounter swarms of stingers, a mad mathematician, a starving lion, a vicious gorilla and the occasional abyss.

Although the graphics leave a little to be desired – the stampeding herd is actually the sign for Pi on the VIC and the 64 – the sound effects are very good.

Once the player reaches the park exit, he can increase his score by progressing onto the next level of play. The game, which comes on a cassette, is controlled by the keyboard or joystick.

Title: Nightmare Park
Company: A.R. Software, 86 Avonbrae Crescent, Hamilton ML3 7PJ, Strathclyde, Scotland
Type: Arcade/adventure
Graphics: Good
Hardware required: 64, monitor, cassette recorder, joystick optional
Price: £7.99
CCI rating: ****

NIGHTMARE PARK
For the Commodore 64
by
A.R. SOFTWEAR

Jumpin' Jack

Many original and successful games have generated their own entourage of copy cat games. Frogger is no exception and has just acquired another version of the original game. This time it is called Jumpin Jack and comes from Livewire Software.

The aim of the game is the same as in the original – hop across the road without getting squashed and navigate the river – with the addition of a few frills. For instance, not only are points awarded for rescuing Jill, the female frog, but they are also awarded for eating the dragonfly in the frogs home bay. As well as the dangers posed by the vehicles, which increase in speed and quantity as the game progresses, there are crocodiles, snakes, turtles and otters to be avoided.

Another frill concerns the graphics, which are three dimensional. Whilst this is no doubt a great selling point of the game, it is also slightly disadvantageous because as the game is viewed from a three dimensional perspective it is slightly difficult to see whether Jack has reached the other side of the road safely or not.

It is possible to control the game using the keyboard or the joystick and, if using the keyboard, the player may re-define the standard set of playing keys according to personal preference.

Title: Jumpin' Jack
Company: Live Wire Software, Sumlock Manchester, 198 Deansgate, Manchester M3 3NE. Telephone 061 834 4233
Type: Arcade
Graphics: Good
Hardware required: 64, monitor, cassette recorder, joystick optional
Price: £8.95
CCI rating: ****

Gridtrap

Gridtrap is a new game for the 64 where the player really does get the boot. It is either that or being blown up. These are the fates that await the player in this new game from Sumlock Microware which forms part of the recently launched Live Wire series. The sole aim is to get as many points as possible by collecting flags and defusing bombs.

So far, the game sounds quite ordinary but it isn't. There is a mixture of high resolution and sprite graphics, Mr Live Wire being a bit of multi-coloured hi-res.

There are several other attractive features to this game, the most important ones being the nine skill levels and the user definable operating keys. This latter feature is very useful if the game is being played from the keyboard although some keys are reserved for other functions. For instance the game can be paused using P, the demonstration screens viewed using V and the melody that accompanies the game can be turned off.

Title: Gridtrap
Company: Livewire Software Ltd., Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233
Type: Arcade
Graphics: Excellent
Hardware required: 64, cassette recorder, joystick optional, monitor
Price: £8.95
CCI rating: *****

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Space Escort

Romik have recently produced some very good games for the 64, most notably Zappy Zooks and Stellar Triumph. By contrast, and taking into account the limitations of the VIC when compared with the 64, Space Escort is disappointing.

As with all games for the VIC, Space Escort comes on cassette and the player is given no less than 26 liners to escort to the newly conquered planet of Sistoria. The journey of the liners is fraught with danger as there are the compulsory hordes of attacking aliens whose sole aim is to destroy the liners and their escorts. This is something they are often successful at doing.

Each liner has several shields, with the colour of the liner denoting how many shields are left. The player starts off with nine escorts with a bonus of four more being awarded on reaching the planet. Once a liner has arrived safely, 8000 points are awarded to the player and the player is advanced on to the next skill level.

The space background is rather boring, but the game, which is controlled either by joystick or keyboard, has several useful features. It is possible to restart a game at any time and freeze the action.

Title: Space Escort
Programmer: Darren Hall
Company: Romik Software Limited, 272 Argyll Avenue, Slough, Berkshire. Telephone 0753 71535
Type: Arcade
Graphics: Average
Hardware required: VIC, cassette recorder, monitor, joystick optional
Price: £5.99
CCI rating: ***

Triad

Another shoot-the-aliens type arcade game, this one being a strange mix of Galaxians and Space Invaders.

The aliens in Triad initially move across the screen like those in Space Invaders and then swoop down in Galaxian style dropping bombs on the players base. The player, of course, has to destroy the aliens and this is a little bit slow because the laser cannon will not fire again until the first shot has exploded.

The fleet of aliens is made up of several different craft worth different amounts of points. As soon as the dive bombing begins, the points score doubles. Once a fleet of aliens has been destroyed, another appears and each time the action gets much more frantic.

The high resolution graphics are quite good and the sound effects are interesting if not outstanding.

Title: Triad
Company: Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233
Type: Adventure
Graphics: Good
Hardware required: VIC, cassette recorder, monitor, joystick optional
Price: £7.95
CCI rating: ***

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Insector

Eating humanoids is not a very nice activity but that is exactly what the aliens do in a game called Insector which is written for the VIC and comes from Romik. Like Skramble, this game also uses up only half of the television screen. What is worse is that, horizontally, the game scene runs off the edges of the television screen.

The aim of the game is simple – destroy the aliens before they eat the humanoids. This is not as easy as it sounds because eventually the whole screen is filled with green and purple aliens, white dots that turn out to be bombs and dozens of insects which cannot be destroyed.

As the commander of the surface patrol fleet, the player sends in six ships one at a time to protect the humanoids. Occasionally a bonus level is awarded for surviving with one craft for a period of time, but this is very rare. Even when this does happen, the advantage is offset by the appearance of an extra insect.

Not all games for the VIC make use of the function keys and it is to its credit that this one does. It is possible to freeze the action at any point and to increase and decrease the skill level.

Title: Insector
Company: Romik Software Limited, 272 Argyll Avenue, Slough, Berkshire. Telephone 0753 71535
Type: Arcade
Graphics: Average
Hardware required: VIC, cassette recorder, monitor, joystick
Price: £5.99
CCI rating: **

Pottit

Question: What do you get when you cross a game of snooker with a game of pool? Answer: A brilliantly simple game called Pottit. The screen background to this game is a pool table but that is where the similarity ends. The game (which must be played by two players) consists of three balls, two of which are controlled by the players.

The rules of the game are quite simple although it does take a little time to get used to them. Basically, hitting or potting the opponents ball or the third ball will score points and the first player to score 50 points wins the game.

However, it is more than just a case of charging round the table trying to score points. The player has to be a master tactician. Controlled by joystick, this is one of those games where the players wish that the joysticks could be bent to give greater control of the cue balls, but the inability to do so only adds to the fun of playing this game.

Title: Pottit
Company: Romik Software Ltd., 272 Argyll Avenue, Slough, Berkshire. Telephone: 0753 71535
Type: Simulation
Graphics: Average
Hardware required: 64, monitor, cassette recorder, two joysticks
Price: £6.99
CCI rating: ***

Neptune's Daughter

Neptune's Daughter is an arcade game for the 64 set underwater which incorporates doing battle with evil sea serpents, gigantic crabs, an octopus and several plants which have the nasty habit of sucking the diver down to his death.

The player must go through all this before Neptune's Daughter can be rescued and led back to the safety of the palace.

The basic screen display is very much like that used for games like Skramble – a long, narrow 'tunnel' of rough terrain inhabited by the sea creatures. At the start of this game, the player is given five lives. One extra life is awarded for the rescue of each maiden (a maximum of nine lives is possible) and points are awarded for destroying practically everything as well as collecting oxygen and feeding the crabs to the serpent.

Title: Neptune's Daughters
Company: English Software, Box 43, Manchester M60 3AD. Telephone 061 8351358
Type: Arcade
Graphics: Good
Hardware required: 64, joystick, monitor, cassette recorder
Price: £9.95
CCI rating: ***

Starship Escape

Not many adventure games have been produced to run on the VIC and those that have quickly go to that great games machine in the sky. Starship Escape could be the exception.

This space adventure takes place in a gigantic alien spaceship, the parts of the player's spaceship being randomly distributed in several rooms. In order to escape from the alien ship the player has to assemble the spaceship by collecting the parts most of which are guarded by the aliens who come in the form of spiders, robots and androids. In this perilous task, the player is not alone. A man's best friend is his dog and in this case K9 is the companion.

The 16K needed to run the game is very well used. Graphically the game is well above average and the colours are quite outstanding for the VIC.

The control of this adventure game is either by joystick or keyboard, the joystick being the easiest method.

Starship Escape is a space adventure game which supports the manufacturers claim that it is compelling and exciting.

Title: Starship Escape
Company: Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester, M3 3NE. Telephone 061 8344233
Type: Adventure
Graphics: Excellent
Hardware required: VIC, 16K expansion, cassette recorder, monitor, joystick optional
Price: £9.95
CCI rating: *****

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Skramble

Written in 6502 machine code, the aim of Skramble is to pilot a craft through the enemy underground installations. The player is equipped with bombs and fire power, the bombs being activated by pressing the space bar. However, it is very difficult to control the craft, fire at the enemy and drop the bombs at the same time. It is also disappointing to note that only half the television screen is used.

At the top of the game screen there is a fuel indicator which is replenished everything enemy fuel tanks are destroyed and points score. Points are awarded according to what is destroyed and how many miles of terrain is covered.

At the start of the game, the player is awarded three lives and has to pass through three phases of the game. The constant attack from ground launched missiles is accompanied by storms of fireballs which cannot be destroyed. Both of these hazards increase in number and speed as the game progresses.

Title: Skramble
Company: Sumlock Electronic Services Limited, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233
Type: Arcade
Graphics: Good
Hardware required: VIC or 64, cassette recorder, monitor, joystick optional
Price: £7.95 for the VIC version and £8.95 for the 64 version
CCI rating: ***

Dots and Boxes

Dots and Boxes, or Squares as the game is sometimes called, used to be played on a sheet of paper with lots of little pen marks forming the boundaries of the game. A computerised version of that game is now available for the 64.

The basic screen layout is an adequate but uninteresting grid of dots that are identified by letters. The aim of the game is to get as many boxes as possible by tactically forcing the opponent into a situation where the only way out is to draw the third side of the box leaving the other player to complete the design.

In this cassette based version, which has the same program on both sides of the cassette, the pen is replaced by the joystick or the keyboard. If the joystick is being used all the player has to do is move along to the required square and 'draw' a line by pressing the fire button. Using the keyboard it is necessary to specify the square by typing in the letter. At the start of the game it is simply a matter of drawing the line anywhere within the grid. As the game proceeds, the player has to think much harder about where to put the next line.

Title: Dots and Boxes
Company: A.R. Software, 86 Avonbrae Crescent, Hamilton ML3 7PJ, Strathclyde, Scotland
Type: Simulation
Graphics: Good
Hardware required: 64, monitor, cassette recorder, joystick optional
Price: £6.95
CCI rating: ***

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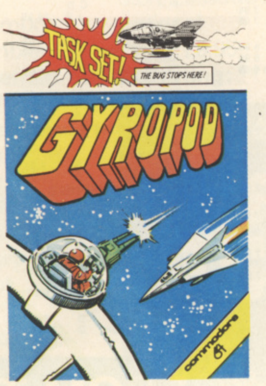
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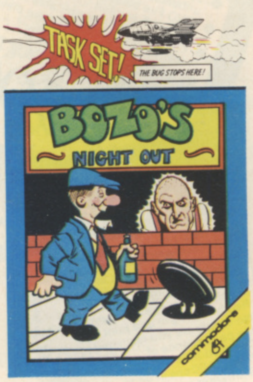

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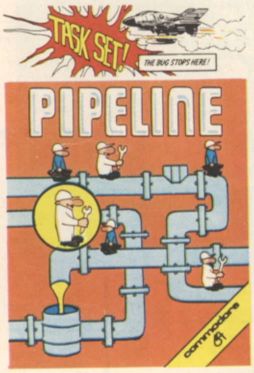
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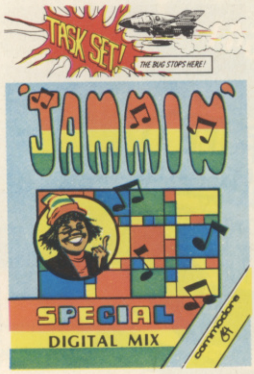

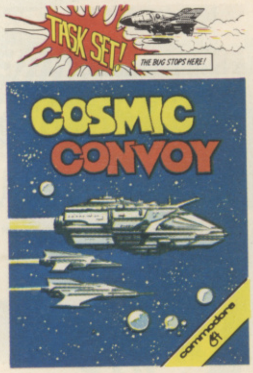

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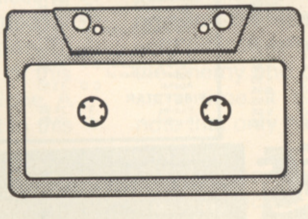

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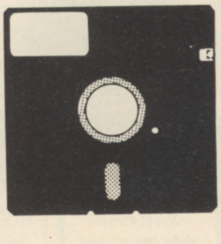

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Programmers friend

Three software programs are featured this month: Dynatech's Codewriter which enables self-generation of programs; Whitby Computer's Softchip, offering the user a choice of commands; and Elmhirst's editor/assembler.

During the past two and a half years Whitby Computers Ltd have been developing and selling various tools and utilities, usually on a cartridge, for Commodore computers. Now they have a new service available for 64 users. The company is marketing 8K custom made cartridges containing the user's choice of commands.

Softchip 64 Programmers Friend and Softchip 64 Business Command Cartridges are standard cartridges which demonstrate the facilities available to customers. These cartridges give the 64 user more control over his machine and are very versatile and useful in themselves. But the most interesting aspect of the service offered by Whitby Computers is the custom made cartridge.

For £35.00 there's a choice of commands. Since the cartridge is 8K it is obvious that it would be possible to have 10 or 12 really powerful commands or many smaller less powerful commands. After making the initial purchase there is a follow up service available. Expansion discs or tapes are available as the user develops his interest.

Both cartridges will work with peripherals on the Commodore serial bus although an IEEE adaptor would be required when using the 4040 and 8050 disk drives.

The commands available in the Softchip range are all the disk commands which Commodore incorporated in the Basic 4 computers but omitted in the CBM 64. However there are restrictions – the 3040 will not recognise the APPEND and RECORD commands and the 1541 will not recognise the APPEND command.

Each command is called up, as usual, by using a keyword – SCRATCH, for instance, deletes a file from the disk. These Softchip commands have a rigid syntax which the 64 understands. If the syntax is wrong the usual syntax error message will appear and a similar message appears for incorrect values. Every Softchip command can be entered in an abbreviated form.

The commands can be entered in either the program mode or the direct mode. Not all the commands can be used in both modes but if one is used in the wrong mode, Softchip will ignore the instruction and carry on to the next. A problem we discovered here is that the user will then have to wait until the end of the program to discover any illegal data which may have been entered.

There are some commands that can be used in either mode. In direct mode, for instance, the disk load command would load the new program, clear the variables and wait for the next command, while in program mode the new program is loaded and the program starts running without having to clear the variables from any previous program.

Future commands will deal with hi-resolution graphics, music, sound effects and an auto start facility. The expansion tape packs will be marketed at a cost of £1 per . 400 extra bytes required, for disk versions an extra £3 must be added.

Name: Softchip 64
Company: Whitby Computers Ltd, 8 Chubb Hill Road, Whitby, North Yorkshire YO21 1JU. Tel: 0947 604966/8
Product: Programmer utility
Applications: Programming and business
Documentation: A good manual
Minimum hardware: CBM 64, printer and disk drive
Price: £35.00 per softchip
Comments: Almost unlimited uses and good value for money.

Your generation

CodeWriter, from Dynatech Microsoftware, is a program generator which allows the user to self-generate programs to suit individual requirements. It runs on the 64 and the 8000 series with a 1541 disk drive ideally, although a 4040 or an upgraded 1540 are acceptable.

With CodeWriter the user concentrates on the structure and control of information rather than the actual programming. The design of the program and control of information is regulated by a series of menus, the first of which is the main menu system. After formatting the disk, the screen on which information is to be entered is created. This is flexible as it is possible to type anywhere on the screen.

Up to 100 fields of information can be fitted onto one screen, a field being one specific piece of information such as the name of a customer.

Customer records should provide prompts for further information like the amount owed and the customer's address. When entering a prompt it is important that the prompt does not contain any dots as Codewriter will search for the dot and assume that the dot is the response. For example, when entering a question which requires a one character response as in 'max. amount

commodore

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64

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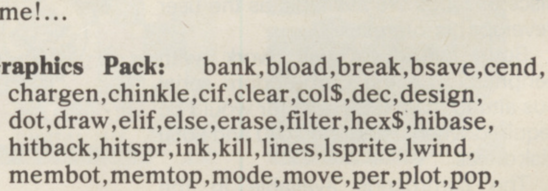

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payable?', CodeWriter will assume that the dot following the abbreviation is the response and that 'amount payable?' is a second prompt. Dots may be entered after a prompt to indicate how much space is available for the response.

In order to edit the initial screen format, it is necessary to alter the position of the information in the memory using the change screen format option. Once the initial screen format is satisfactory, data is entered into memory by hitting the escape key.

After a few seconds the screen returns and the user then defines whether the operator or CodeWriter calculates the response. Where the prompt concerns numeric data, it is far quicker to generate a CodeWriter response.

CodeWriter calculates addition, subtraction, division and multiplication. Brackets can be used to isolate components in formulae.

A reference field can be created which allows the user to hold a previous value while calculating a new one. Whenever CodeWriter sees a calculation with the same program calculation number on both sides of the calculation, a special file for reference fields is automatically created. A similar operation can be performed with keyboard entered fields using the update data option.

User-defined error messages can be entered using everyday language so that the relevant message appears at the appropriate stage. Once the program format is complete, the user converts the program into BASIC. This automatic conversion is performed by pressing return when the correct date format is entered.

The CodeWriter disk should be removed when the computer prompts the user to do so, and replaced with the formatted disk. The program will then be saved onto disk.

Name: CodeWriter
Company: Dynatech Microsoftware, Summerfield House, Vale, Guernsey, Channel Islands. Telephone 0481 20155
Product: Program generator
Application: Record management
Documentation: Good manual and demonstration disk
Minimum Hardware: 64 or 8000 series; 1541, 4040 or 1540 disk drive; compatible printer
Price: £85

The assembly line

Elmhirst Enterprises' assembler, Osirisan, and its companion text editing program, Freditor, are designed for use with the Vic-20 and the 64. They are not intended for the novice.

Available on tape or disk, the assembler is written in 6502 machine code and enables the user to create programs in machine code using symbols for instructions and data.

If used with the 64, a minimum 8K expansion is required and a 1540 or 1541 disk drive. A larger amount of expansion will give greater flexibility.

Use of the editor, which eventually produces the source file, is required in the first stages assembly. Like most editors, Freditor has a scroll feature. More than 230 characters can be entered onto each line using scroll to the right. Full use of the function keys is made so scrolling is not confined to a horizontal direction. A full page may be moved backward or forward.

The area in which text is entered is automatically adjusted as additional text area is added. It is possible to save, move, delete and duplicate areas of text to other areas of the file. This editor uses the standard mnemonics for the 6502 as well as the symbolic features of Osirisan. Commands to the editor are given when it is in the menu mode. Commands are single key operations and the main menu can be viewed at any time without losing or altering text.

Once the source file has been created and is ready for assembly, the program can be left in memory to be recalled by one of the Osirisan options, or saved.

On printing out text it is necessary to specify if a parallel or serial printer is being used. A parallel printer prints out quicker, but the user will need an interface cable with a 36 pin d-type connector on one end and a 24 pin card-edge connector on the other.

Two sorts of printouts can be obtained. A listing gives a complete record of the program and an object file is in a form which can be converted to executable code called the object code.

After completion of the source file, assembly can begin. If tape is used, it is not possible to read and write at the same time and the manufacturers suggest that the user should load the program from tape to memory using the F7 key and assemble the file using the memory option for the source file.

After the hex file has been loaded into the memory, it may be executed by entering the start and end address of the memory along with the filename.

The source file is assembled in two phases, the first phase evaluating the program statements, incrementing the programs counter and building up a symbol/value table. The second phase supplies the symbols and values which are obtained from the symbol table, and generate the object code.

The object code is generated in a sequential file in the form of intel hex where the information is stored as a sequence of ASCII characters that form a record.

The complete file generated in the form of intel hex is a series of records initiated by the colon. The records that follow should include the number of bytes of data per record as well as the start address of the data and hexadecimal data, some form of checking all the data following the colon and a means of displaying the information/results.

Title: Osirisan and Freditor
Company: Elmhirst Enterprises, 99 Porchester Road, Hucclecote, Gloucester. Telephone 0452 64938
Product: Editor/assembler
Applications: Text editing and program design
Documentation: Manual
Hardware required: 64 or VIC, cassette recorder or 1540 or 1541 disk drive, minimum of 8K expansion, any compatible serial or parallel printer
Price: £22.95 for the disk version. £19.95 for the tape version

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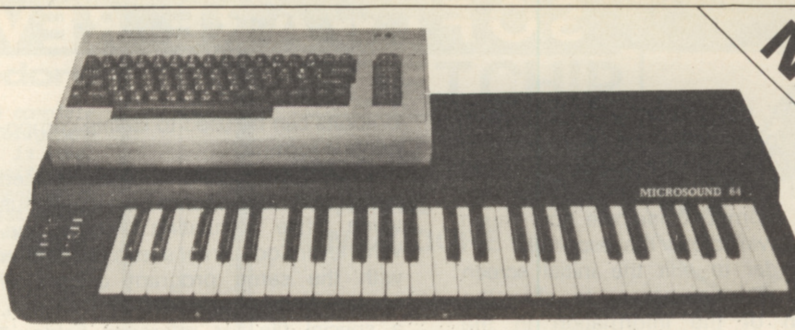

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Pixstik pictures

Following the announcement of Commodore's International Computer Art Competition, we look at two lightpens for budding computer artists – the pixstik and the datapen. We also look at the Amber 4000, a mini-printer from Lethaby Numbering Systems.

Although the pixstik is not the most sensitive and powerful lightpen we have ever seen, the accompanying program is very good.

Once the program is loaded in, the menu of commands and colours appears on the top of the screen and stays there. The manual is clear and explains what each command does and how it can be used on the screen.

The commands are divided into four groups. By selecting the pixstik mode – the colour, the type of drawing pattern (circle or triangle for instance) and the style (paint brush or filled in) – the pixstik can be used to design a number of different types of pictures. Sixteen colours, three painting styles and several pattern shapes can be utilised. The necessary moves for each effect are explained in the manuals' drawing examples.

The program presents you with a blue screen and a black border and although it is possible to change these, the pixstik does not like certain colour combinations. The manual advises that a light screen and a dark border should be selected, but taking that advice doesn't ensure perfect results. For instance the pixstik light grey colour would not pass over a light orange screen. Similarly, a dark pink would not even consider going over a dark blue. Altering the screens brightness often had a favourable effect but contrary to the manuals advice we found that fading the colour to almost white helped. The main irritant was when the lightpen would not go onto the control panel without altering the lightpens colour first.

Unlike most lightpens, the pixstik has no switch on the pen itself so the keyboard had to be used to control the light sensor. The sensor was comparitively weak and the pen had to be held two inches or less from the screen to have any effect. Even then it was sometimes rather insensitive, refusing to plot a continuous line unless the screen was blue or having no effect at all on the screen.

As well as the excellent paintbox program three others were included on the tape. In tic tac toe the player competes with the program to complete a full line of squares. In FLAK, enemy aircraft must be shot down using the pixstik, and the computer and pixstik are used in Melody to turn the screen into a musical keyboard.

The Pixstik would be useful for the hobbyist who wanted a lightpen for creating pictures from a program already created. It can be used to design programs, but its limitations make it unsuitable for more professional applications.

Product Name: Pixstik
Product: Lightpen and program for creating colour graphics
Price: £29.95
Pixstik package: Lightpen
Cassette with paintbox program containing three programs
1 manual
Pixstik details: CBM 64 and VIC 20 versions available
Black pen (12cm long)
Black extendable cable plugs into port 1 of CBM 64 and I/0 port of VIC 20
Paintbox program features: X-Y coordinates
16 colours
16 command boxes – 4 command groups
Stik mode: 1,2,3, screen and border
Shape mode: freehand, straight lines, triangles, rectangles, circles and ellipses
The options: blocks, paintbrush style and filled in.
Reset/clear
Window mode: animates, bouncs and cartoon style
Memory stores 4 screen displays
3 programs: Tic tac toe, FLAK and Melody
Requirements: Mono or colour television/monitor
C2N cassette recorder
Applications: Lightpen – used with personal programs. With Program – designing pictures.
Contact: Computapix Ltd, Gores Road, Kirkby Industrial Estate, Liverpool. tel 051 547 2741

We were very impressed by this lightpen and the accompanying program. The lightpen has some useful features and the booklet and cassette explain exactly what these are, how the pen works, how to utilise its capabilities to their best advantage in program routines and how to effectively use the Commodore graphic abilities.

The light sensor of the pen is very powerful and will pick up information from the screen even if it is held a foot away from the screen. Local light has no effect on the lightpen so that it reacts with all colours and there is no need to alter the brilliance controls.

A red light, the LED indicator at the end of the pen, lights up whenever there is anything on the screen. This indicates to the operator whether the lightpen is working or not. Using the white switch set in the pen's side, the pen can be told to ignore any signals. This enables the operator to get the pen to the position desired before actually using it.

The various items of written information accompanying the lightpen are lucid and fairly easy to understand, even for a comparatively inexperienced programmer. The difference between the Datapen lightpen and program and the pixstik lightpen and paintbox program (see review) is that the latter is mainly intended for use with the program already designed. The program and handbook with the datapen lightpen could be utilised to design a program such as Paintbox.

The introductory program on tape shows among other things how to find routines for your own programs. Air balloon sprites appear at the end and these can be moved around with the pen. A listing is provided and can be studied in conjunction with the program. With the Colour-Draw program the operator can draw, using either a fast or slow menu, any of the Commodore characters and colours. The drawings can be saved. The Hi-Res draw program can be used to produce high resolution drawings. Using a menu displayed on the screen, several drawing styles can be chosen; lines, dots, turtle, continuous and erase. These can all be saved.

The pen draws with a fair degree of accuracy and anyone with this package and a relevant computer handbook would have a good chance of designing a program for use with this lightpen.

Product name: Datapen lightpen
Product: Lightpen
Price: £25
Datapen package: Lightpen
Explanatory handbook
Cassette with introductory program and two drawing programs
Printed listing of introductory program
Datapen details: CBM 64 and VIC 20 versions available
Cream pen (12.5cm long)
Optional rubber nozzle
Grey cord (1.4m) plugs into port 1 of CBM 64 and I/0 port of VIC 20

Art for a

Read the small print

Lethaby Numbering Systems have produced a mini printer – the Amber 4000, a quarter the size of a more conventional printer. To work with the CBM 64 or VIC 20, a special driver program and interface is needed.

Once the driver program is loaded into the computer it is ready to print. Although the printer is unusually small, it has a varied repertoire of printing sizes and styles including graphics which are intended to provide flexible print outs. Control and escape codes are used to select the printing functions. All printing is carried out on a roll of paper similar in size and design to a till roll.

Obviously the Amber 4000 does not have the same functional capacity as a larger printer, but it can still be used in a wide variety of specialised applications. Some of the ways existing owners use it for are listed below. Programmers for instance often use it for strings of calculations, tables of figures, dumps of results and even on a limited scale, printing picture screen dumps. Printing out listings will have its restrictions because the printer will not work directly with pet graphic characters. Some hospitals and medical centres use it for recording respiratory rates and the volume of air in lungs. A small business many find it useful, for example a tool manufacturing firm uses it to record the settings that were used to test component parts of the tools. These were then kept for future use.

The Amber 4000 is very easy to use and the accompanying manual is clear and precise. Sixty-seven control codes are listed and each of the printing commands are explained in detail. In addition examples of the controlling programs are given. Lethaby have not yet decided how they will be marketing this printer. It is diminutive in size and the small paper roll will have a restrictive effect on printouts, but for some applications the Amber 4000 should do very well.

Product Name
Amber 4000 printer.

Product
Mini printer.

Price
£125 (approx.).

Printing functions
27 control codes
True descenders
Underlining
Emphasized print
Hash to pound swap
Variable line spacing
Block and line graphics
20-46 characters per line
Column width 10-46 characters
8 line widths
Double height and width characters
Border mode.

Other features
Mini word processing function
Vertical tab
5.7cm width paper roll.

Size
3"H × 6"W × 9"D.

Weight
1.4 Kg

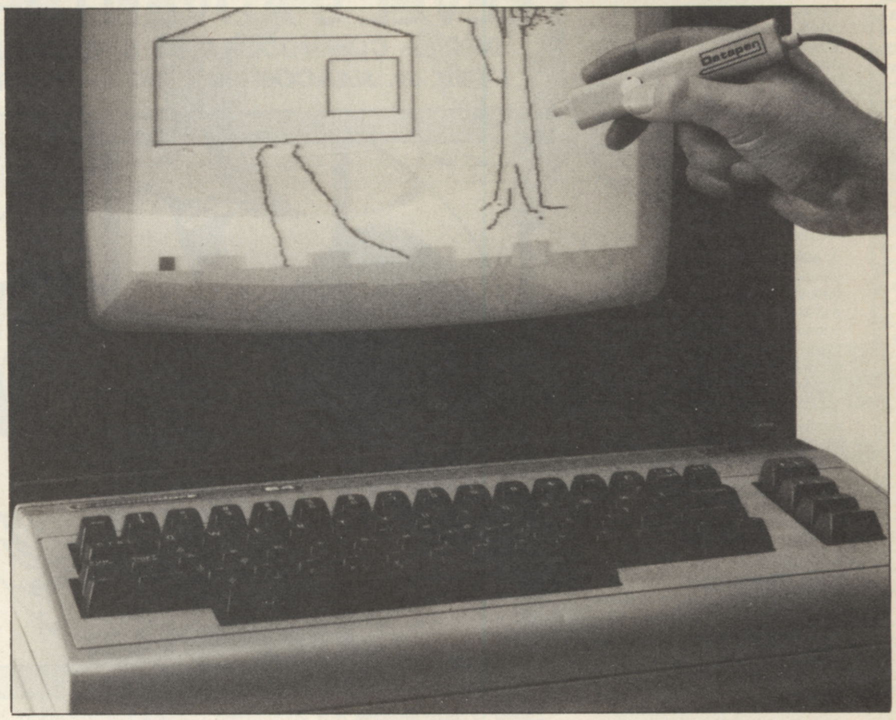
Additional requirements
Driver program for CBM 64 and VIC-20 and power supply (both included in price).
The CBM 64 and VIC-20 interface is available from company for 18.

Applications
Various uses in home and in small business.

Contact
Lethaby Numbering Systems, Central Way, Andover, Hampshire SP10 5AL. Tel: 0264 65951.

art's sake

Datapen features: Insensitive to environmental light
Red LED indicator
Data control switch
Fast strobe
Program features: Introduction to use of lightpen
Colour draw
Hi-Res draw
Requirements: Mono or colour television/monitor
CN2 Cassette recorder
Applications: Creating shapes, technical drawings and moving pieces in games
Booklet explains how to access the features of the pen
Warranty: One year guarantee
Contact: Datapen Microtechnology Ltd, Kingsclere Road, Overton, Hants. Tel: 0256 770488



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REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners . . Simply smashing!" *– Soft, Sept 83*

"**Colossal Adventure** is included in Practical Computing's top ten games choice for 1983: "Poetic and tough as hell." *– PC, Dec 83*

"To sum up, **Adventure Quest** is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you" *– NILUG issue 1.3*

"**Dungeon Adventure** is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!" *– Educational Computing, Nov 83*

"**Snowball** . . As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denziens . . this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers." *– Which Micro?, Feb 84*

"**Lords of Time.** This program, writen by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue . As we have come to expect from Level 9, the program is executed with wonderful style – none of those boring "You can't do that" messages! Highly recommended." *– PCW, 1st Feb 84*

TUNNEL

COMMODORE 64 EXTENDED BASIC

This Package comes in the form of a cassette and a thirty page instruction manual. It is designed to allow the BASIC Programmer to make full use of the advanced sound and video interface devices built into the computer and at the same time provide useful utilities. An assembler has been included as an integral part of the package so that the advantages of BASIC and machine code can be intermixed in one program.

LOADING: the cassette contains the program which has to be loaded into the computer before any of the new commands can be used. This is done simply by pressing SHIFT and RUN/STOP together or by typing LOAD. Either way, the Program will load from the tape and automatically run so that it is now ready to be used. To save time when loading the program a TURBO loader is included. This is a small program which loads itself into the computer and then loads in the extended basic in a mere fourty-five seconds, (as fast as if it were loaded in from a diskette). This does NOT mean that another program has to be loaded in first, all the necessary loading is fully automated once LOAD has been typed for the first time.

LOCATION: once the program is loaded, it will position itself in the memory behind the resident BASIC ROM and several other smaller places which are not normally used by the computer. This means that the program will only take 2.5k away, leaving 35.5k available for the storage of a BASIC program. The extended basic is 16k in length and is located from $9800 to $d900 hex. It does not replace the original BASIC ROM. All the new commands work in addition with the existing basic, however, any small pieces of software enabling the computer to be used with non standard printers, etc will not work.

INSTRUCTION MANUAL: Provided with the program is a thirty page manual which explains how to use each command separately and in conjunction with other commands. An understanding of commodore basic is assumed.

GRAPHIC commands: the package allows the selecting of display modes and storage of one text and one graphic screen at the same time. There is a full set of colour and drawing commands which enable the drawing of dots, lines, solid rectangles and solid triangles. Five powerful sprite commands are included which enable fast sprite manipulation and definition.

SOUND commands: there are four sound commands which combined form an extremely powerful synthesiser. This section is designed to make music at a higher level than the BBC micro, for instance the pitch of a note can be represented using the standard notation 'c#5 as well as number form. This allows music to be written and debugged with much ease. All the functions of the sound device are incorporated into the new commands, as well as the software music and frequency modulation techniques.

STRUCTURED PROGRAMMING: there are five commands added to assist in this field. This includes the well known PROCEDURE commands which allows second generation subroutine nesting.

UTILITIES: provided are commands for accessing the disc drive, copying the screen to the printer, defining the function keys, program line deletion, and other useful commands, such as RENUMBER which will renumber a program including goto's, gosub's, on... goto's, etc.

ASSEMBLER: the three pass assembler acts in the same way as the assembler resident in the BBC micro. The source code is contained in the BASIC program and is assembled using one of the commands.

There are in total FIFTY ONE extra multifunctional commands as well as the assembler contained in the package. The cost including postage, packing and VAT is **£14.95**

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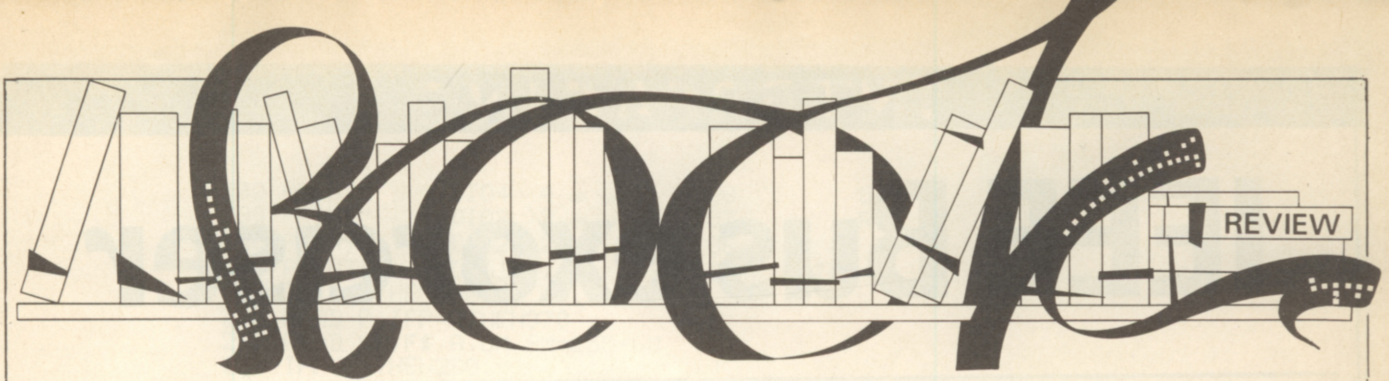
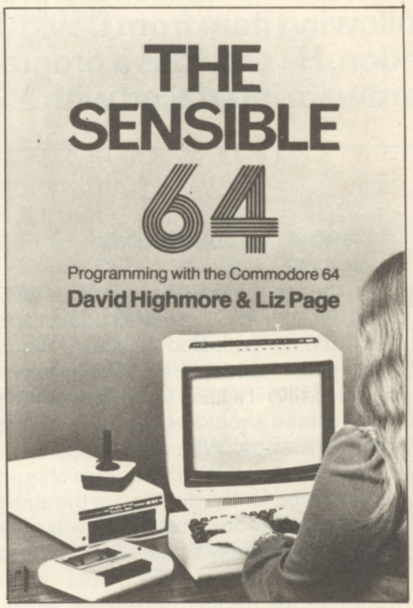


THE COMMODORE
64
PROGRAM BOOK



Getting MORE from your
commodore
64
Mark Harrison
Sigma Technical Press

Every growth industry produces a load of rubbish! The computer industry is no exception. The last few years have seen a phenomenal worldwide increase in the number of computers used in business and, more recently, at home. It seems that in the last few years the public has been so desperate for information about computers and so indiscriminate in its buying habits that some people have made small fortunes out of producing rubbish.

Thankfully it now looks as if things are settling down. The cowboys are beginning to collapse one by one as the public becomes more and more discriminating. This current crop of books encourages the belief that the time when you could stick a few ill thought out, badly printed and, worst of all, unchecked programs between garish cardboard covers and confidently expect to sell 20,000 copies is now past.

The books now appearing which cover Commodore machines actually look as if they're the end product of some care and thought. This is not to say there have not, until now, been no good books about Commodore machines. It's just that the good books have been vastly outnumbered by the bad or indifferent books. Commodore 64: getting the most from it (Prentice/Hall, £7.95) is an example of the better quality books which are now arriving on the scene.

One of the reasons why Commodore machines seem to produce such a plethora of books is that the literature supplied by Commodore themselves isn't exactly the most enlightening reading possible! Commodore 64: getting the most from it, on the other hand, is enlightening. It's nowhere near as clumsily written as its title but is relatively jargon-free and easy to read.

Non-American readers may find the chatty, almost patronising, style somewhat tiresome but will nonetheless find it well worth while persevering. Three 'guest writers' have added three appendices – the ubiquitous Jim Butterfield takes us on a tour of the 64's innards, Paul Schatz explores graphics and Frank Covitz looks at sound and music. An excellent tome, warmly recommended.

The three other books about the 64 in this month's batch suffer from a comparison with Tim Onosoko's book. Getting More from your 64 (Sigma Technical Press, £6.95) by Mark Harrison has been written and published in the UK and is a more modest book. It is good as far as it goes and is probably best described as a good, comprehensive beginner's book.

The Sensible 64 (Micro Books, £5.95) by David Highmore and Liz Page is a little bit too much like your do-it-yourself amateur publishing! It's not very well produced (the binding leaves a lot to be desired) and it's a long way behind two books we've looked at already. This is the way the book starts: the heading 'Input to the computer' is followed by 'There are times when you may wish to access information from the keyboard without using the INPUT command.' There is no introduction, no chapter heading, no real attempt at user friendliness!

The Commodore 64 Program Book (Phoenix Publishing Associates, £4.95) by Vince Apps is, as the title suggests, a book of programs. They are mainly games, although there are one or two utilities, line renumber and an assembler/disassembler. On the whole the programs are unexceptional but they seem to work. There are 25 programs in 122 pages so you can get some idea of the complexity of the programs.

IEEE Bus exorciser

Interfacing problems are amongst the most difficult to trace and solve. We were therefore delighted to receive the following item from David Jones at King's College London. He provides a program for testing hardware interfaced with a PET.

If you have ever experienced instrument malfunctions in a PET-controlled IEEE Bus system, the program published here may well have been of assistance in locating the source of the problem.

The PET BASIC program enables all of the IEEE lines to be examined using either a 5V testmeter or (better) an oscilloscope. Each line is tested in both the output mode and in the input mode.

In the output mode the individual IEEE lines are pulsed by the program in turn, the pulse duration being set by the user. If a voltmeter is being used for the test then a pulse duration of about 500 ms should be selected. If using a 'scope then both short durations (1 ms) and long durations are useful. Short durations enable the rise time of the pulse to be examined while long durations enable any intermittency to be discovered. Note that if short durations are selected the pulse length will be somewhat variable because of PET interrupts.

In the input mode the individual IEEE lines are set FALSE by the program and the user is requested to short circuit appropriate pin pairs. When short-circuited the FALSE message on the PET's screen should be replaced by the TRUE message. With the exception of the SRQ test, the TRUE message should be displayed for the duration of the short circuit. For the SRQ test TRUE will only be displayed briefly as the short circuit is made because, in PET, SRQ is a transition (as distinct from level) sensitive function.

The tests should be made at the instrument end of the IEEE cable thus testing the cable as well as the PET. If you have a number of instruments it is a good idea to connect all your IEEE cables in series and make the test at the end.

The IEEE connector pin-out will be displayed on the screen for the duration of the test. If using a 'scope take care to ensure that the ground terminal of the test lead is connected to the ground IEEE lead and not to the active line. Jiggle the lead around while the test is in progress to make sure that the connection is not intermittent, though you will probably only be able to see intermittent contact if using a 'scope.

In my experience it is the IEEE leads or the connector on the PET IEEE port that is more likely to give trouble than PET's hardware. However the PIA's and the VIA in PET (to which the IEEE leads are connected) have been known to fail! Making the tests on an edge connector plugged onto the motherboard will enable you to decide if it is PET or the connectors or leads which are faulty.

The program should enable you to exorcise most IEEE problems associated with PET itself or with connecting leads.

```
10 L=-1
20 PRINT"]  IEEE BUS EXORCISER - OUTPUT":PRINT:PRINT          ! CLR
30 PRINT"THIS PROGRAM PULSES THE IEEE CONNECTOR"
40 PRINT"PINS IN SEQUENCE AT A RATE SET BY THE"
50 PRINT"USER.  TEST WITH AVO METER OR (BETTER)"
60 PRINT"A SCOPE.   AFTER TEST HIT ANY KEY":PRINT
70 IFL<>-1THEN100
80 PRINT"ENTER REQUIRED PULSE DURATION":PRINT"IN MILLISECONDS"
90 INPUT L:GOTO20
100 PRINT"   SHIELD 12 ▒ ▒ 24 DIG GND      "
110 PRINT"      ATN 11 ▒ ▒ 23 ATN GND      C"
120 PRINT"      SRQ 10 ▒ ▒ 22 SRQ GND      O  P"
130 PRINT"      IFC  9 ▒ ▒ 21 IFC GND      N  I"
140 PRINT"     NDAC  8 ▒ ▒ 20 NDAC GND     N  N"
150 PRINT"     NRFD  7 ▒ ▒ 19 NRFD GND     E"
160 PRINT"      DAV  6 ▒ ▒ 18 DAV GND      C  O"
170 PRINT"      EOI  5 ▒ ▒ 17 REN          T  U"
```

```
 180 PRINT"       DIO4  4 ▒ ▒ 16 DIO8         O  T"
 190 PRINT"       DIO3  3 ▒ ▒ 15 DIO7         R"
 200 PRINT"       DIO2  2 ▒ ▒ 14 DIO6 "
 210 PRINT"       DIO1  1 ▒ ▒ 13 DIO5 ":PRINT
 220 IFFL=1THEN490
 230 READ P:IFP=0THEN370
 240 READ PP,F$,A,OM:AM=255-OM
 250 IFP<>1THEN280
 260 PRINT"CONNECT PROBE TO PIN 24 & 1;2;3;4;13"
 270 PRINT"14;15 AND 16 IN TURN TO TEST DIO LINES":GOTO290
 280 PRINT"CONNECT TEST PROBE TO PINS ";P;" & ";PP
 290 PRINT"NOW PULSING ";F$;" (";L;" MS.)"
 300 GETA$:IFA$<>""THEN300
 310 POKEA,PEEK(A)ANDAM
 320 FORI=0TOL:NEXT
 330 POKEA,PEEK(A)OROM
 340 FORI=0TOL:NEXT
 350 GETA$:IFA$=""THEN310
 360 GOTO20
 370 PRINT"▓NOW CHECK AS FOLLOWS:"                                    ! CRSR DOWN
 380 PRINT"   PIN 9/21 (IFC) SHOULD BE HIGH"
 390 PRINT"   PIN 10/22 (SRQ) SHOULD BE HIGH
 400 PRINT"   PIN 17/24 (REN) SHOULD BE LOW
 410 GETA$:IFA$=""THEN410
 420 FL=1:PRINT"⊐    IEEE EXORCISER - INPUT":PRINT                    ! CLR
 430 PRINT"THIS PROGRAM TESTS IEEE INPUT."
 440 PRINT"TO USE - SHORT CIRCUIT THE INDICATED"
 450 PRINT"PINS.  WHEN SHORTED THE 'TRUE' MESSAGE"
 460 PRINT"SHOULD BE DISPLAYED.  (WHEN NOT SHORTED"
 470 PRINT"THE 'FALSE' MESSAGE SHOULD APPEAR)."
 480 GOTO100
 490 READP:IFP=0THEN810
 500 READPP,F$,A,AM
 510 PRINT"TO SELECT NEXT TEST HIT ANY KEY"
 520 PRINT"SHORT ";P;" AND ";PP;" (";F$;").":PRINT
 530 I=PEEK(A)ANDAM
 540 IFP=10THENI=ABS(I-128):K=PEEK(59426):REM CLR SRQ FLG
 550 IFI=AMTHENPRINT"ℸ";F$;" IS NOW FALSE   "                      ! CRSR UP
 560 IFI=0THENPRINT"ℸ";F$;" IS NOW ▚ TRUE ▀"                         ! RVS, RVS OFF
 570 GETA$:IFA$=""THEN530
 580 GETA$:IFA$<>""THEN580
 590 GOTO420
 600 DATA11,23,"ATN",59456,4
 610 DATA8,20,"NDAC",59425,8
 620 DATA7,19,"NRFD",59456,2
 630 DATA6,18,"DAV",59427,8
 640 DATA5,24,"EOI",59409,8
 650 DATA1,24,"ALL DIO LINES",59426,255
 660 DATA 0
 670 DATA10,22,"SRQ (TRANS SENS.)",59427,128
 680 DATA8,20,"NDAC",59456,1
 690 DATA7,19,"NRFD",59456,64
 700 DATA6,18,"DAV",59456,128
 710 DATA5,24,"EOI",59408,64
 720 DATA1,24,"DIO1",59424,1
 730 DATA2,24,"DIO2",59424,2
 740 DATA3,24,"DIO3",59424,4
 750 DATA4,24,"DIO4",59424,8
 760 DATA13,24,"DIO5",59424,16
 770 DATA14,24,"DIO6",59424,32
 780 DATA15,24,"DIO7",59424,64
 790 DATA16,24,"DIO8",59424,128
 800 DATA0
 810 PRINT:PRINT:PRINT"▚ END OF TEST ▀"
READY.
```

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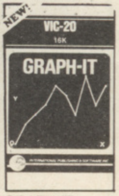
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LETTERS

Dear Sir,
In my first letter, which you published in the February 1984 issue of Commodore Computing, I promised to update you on the outcome of my dealings with Commodore. I am pleased to be able to report that the matter has now been settled. In early December Commodore wrote to me advising that Commodore would honour the claim. I was required to return the equipment to them and after being checked, they would send me my refund. This they did by mid-January.

I should add that the dealer involved returned the equipment at his own expense and, contrary to your editorial comment after the published letter, I have no complaint against the dealer at all.

Nigel Clark,
Chesham,
Bucks.

Dear Sir,
I was most interested in the article on the construction of a computer piano board in the December issue of Commodore Computing and intend to construct the system.

However, I have so far been unable to locate a supplier of a keyboard as described in the article. I would be most grateful if you could give me the address or telephone number of a stockist.

S Hickman,
Bath,
Somerset.

The keyboard used in our feature was supplied by mail order company Maplin Electronic Supplies, who can be contacted at PO Box 3, Rayleigh, Essex SS6 8LR. Telephone 0702 552911.

Dear Sir,
On the game PETDO (CCI October issue) we have got control problems. We can move left, up and down, but not right. The fire control does not work either. Our computer is a PET 4016.

Neil Morrison,
Crawley,
Sussex.

All our programs are thoroughly tested before they appear in Commodore Computing, so make sure that you have entered all data correctly. Check the values of K from Line 250 to line 290 paying particular attention to line 270 (which controls movement to the right) and line 290 (which controls fire).

Dear Sir,
In your issue, Vol 2, No 2, in the Hints and Tips section you published a routine to disable the RUNSTOP/RESTORE keys on the VIC-20. This involved addresses 808 and 37150. I have tried using the routine on the VIC-20 (with 3K expansion) and find that although the routine works if entered in direct address before RUNning a program, when incorporated into the listing the routine crashes and returns a BREAK ERROR message whenever a program routine is encountered which includes READ statements in a FOR . . . NEXT loop. Have you any suggestions?

Also, can your refer me to any article in your magazine (or any other source) which explains how BASIC listing may be rendered 'unsaveable', ie copyproof?

R Fletcher,
Glasgow,
Scotland.

A well-timed letter! Both these queries are dealt with in the Hints and Tips section of this issue (April). There is a routine to disable RUNSTOP for all Commodore machines and also some useful tips to render BASIC listings unsaveable. Although the latter are intended for the 64, it should point you in the right direction.

Dear Sir,
It was with some surprise that I saw you had published my letter on your letter page of the Bumper Christmas issue. It is easy to ignore letters of criticism, but there you were – actually showing that you do receive some. Actually I was generalising and not pointing an accusing finger at your magazine.

However, getting back to my original complaint – not being able to find a program that I can type in and RUN without a mistake occuring – I turned to a program in the December issue which would allow me 16 defined function keys. This would no doubt aid a beginner such as I.

After typing in the program I confidentally typed RUN only to be informed there was an ILLEGAL QUANTITY ERROR on line 18. Careful checking only revealed that I had typed in the program correctly so where had I gone wrong.

Ken Whiteley,
Hemel Hempstead,
Herts.

In reply we can only reiterate that all our programs are tested on the Commodore machines here in the office and then printed out, using the printouts as artwork. This leaves little margin for error. Since receiving Ken Whiteley's letter we have run through the program again and there are no errors.

Reader Service

We welcome letters and queries for publication on this page. We would ask readers, however, not to send stamped address envelopes for replies. Much as we would like to answer all letters personally we regret are unable to do so. We will do our best to answer all letters and queries on this page.

Please make letters short and to the point. The editor reserves the right to edit letters where necessary.
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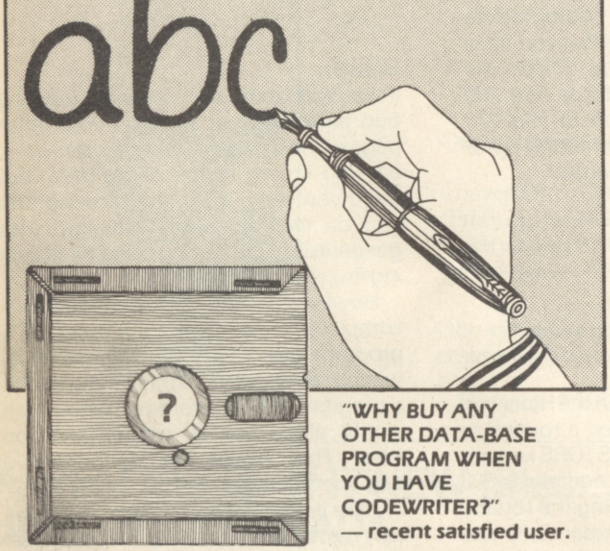

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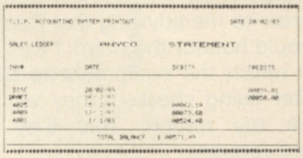

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Program security

This month we are going to take a look at how to secure your programs from prying eyes (and fingers).

The first thing that is required to protect a program is the need for an auto-run ie the program will load and run whichever way it is loaded. Because there will be a lot of people reading this article we will not explain anything as to how this is done but at the end of the article there is an auto-run routine for the 64. Owners of PET computers will find an equivalent routine in the August 1983 edition.

The auto-run routine is set up so that you load the program in and run it. This will put the machine code into memory. You then load your own program and save it using: SYS(49152) "filename": SAVE in direct mode. This routine will only work on tape.

The auto-running of a program is the 'primary' form of protection. Inside your Basic program you must put some 'secondary' protection methods. These are things like disabling RUN/STOP, LIST, SAVE, etc.

DISABLE RUN/STOP

This is done thus:

CBM 64: POKE808,251
PET B4: POKE144,88
PET B2: POKE144,49
PET B1: POKE537,136
VIC 20: POKE808,126

This command should be the first command in the Basic program. Provided that the program is totally de-bugged and will not cause any syntax errors, this is the only 'secondary' protection required.

Disable List

Just in case the program causes an error, it would be nice to stop anybody listing the program to see how it works.

This can be done in quite a few different ways, the first would be just to stop it listing but otherwise keep the program. Or at the other extreme one could cold start the machine on the list command.

On the 64, these are done thus:

Cold start: POKE774,226: POKE775,252
Just disable: POKE774,131: POKE775,164

Disable Save

Another useful routine to disable would be the save routine. This can be done in the same way as the disable of the list command and would have the same results.

For the 64, it would be done thus:

Cold Start: POKE818,226: POKE819,252
Just Disable: POKE818,131: POKE819,164.

Error Messages

The above two commands could be made redundant by this command: POKE768,226: POKE769,252.

This will cause the 64 to cold start at the occurrence of any error message and thus do away with the need for the previous two.

```
10 I=49152:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:T=T+A
40 I=I+1:GOTO20
50 IFT<>37131THENPRINT"CHECKSUM ERROR"37131,T:END
60 IFI<>49431THENPRINT"NUMBER OF DATA VALUE ERROR":END
70 PRINT"♥QQQQ■TO SAVE A PROGRAM WITH AUTO-RUN ENTER:"
80 PRINT"Q■■SYS(49152)"CHR$(34)"FILENAME"CHR$(34)":SAVE":END
100 DATA165,43,141,23,193,165,44
110 DATA141,24,193,169,165,133,43
120 DATA141,2,3,169,2,133,44
130 DATA141,3,3,165,45,141,25
140 DATA193,165,46,141,26,193,169
150 DATA3,133,46,169,4,133,45
160 DATA162,86,189,192,192,157,165
170 DATA2,202,16,247,169,8,133
180 DATA252,169,0,133,251,160,1
190 DATA177,251,73,255,145,251,200
200 DATA208,247,230,252,165,252,201
210 DATA160,208,239,32,212,225,169
220 DATA3,133,185,32,89,225,173
230 DATA23,193,133,43,173,24,193
240 DATA133,44,173,25,193,133,45
```

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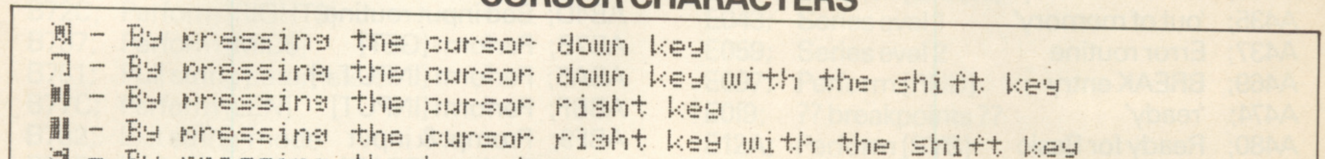
```
250 DATA173,26,193,133,46,169,135
260 DATA141,50,3,169,192,141,51
270 DATA3,169,131,141,2,3,169
280 DATA164,141,3,3,169,0,133
290 DATA157,96,169,237,141,50,3
300 DATA169,245,141,51,3,169,1
310 DATA170,168,32,186,255,169,1
320 DATA162,121,160,192,32,189,255
330 DATA32,89,225,169,0,133,251
340 DATA169,8,133,252,160,1,177
350 DATA251,73,255,145,251,200,208
360 DATA247,230,252,165,252,201,160
370 DATA208,239,96,169,131,141,2
380 DATA3,169,164,141,3,3,169
390 DATA0,133,157,32,213,255,169
400 DATA1,170,168,32,186,255,169
410 DATA1,162,166,160,2,32,189
420 DATA255,169,0,32,213,255,134
430 DATA45,134,47,134,49,132,46
440 DATA132,48,132,50,160,0,132
450 DATA251,169,8,133,252,200,169
460 DATA255,81,251,145,251,200,208
470 DATA247,230,252,165,252,201,160
480 DATA208,239,169,0,32,94,166
490 DATA32,142,166,76,174,167,-1
READY.
```

CURSOR CHARACTERS



```
▓ - By pressing the cursor down key
▓ - By pressing the cursor down key with the shift key
▓ - By pressing the cursor right key
▓ - By pressing the cursor right key with the shift key
▓ - By pressing the home key
▓ - By pressing the home key with the shift key
▓ - By pressing the control key and key 1
▓ -                                 key 2
▓ -                                 key 3
▓ -                                 key 4
▓ -                                 key 5
▓ -                                 key 6
▓ -                                 key 7
▓ -                                 key 8
▓ - By pressing the CBM key with    key 1
▓ -                                 key 2
▓ -                                 key 3   ▓ - By pressing key F1
▓ -                                 key 4   ▓ - By pressing key F2
▓ -                                 key 5   ▓ - By pressing key F3
▓ -                                 key 6   ▓ - By pressing key F4
▓ -                                 key 7   ▓ - By pressing key F5
▓ -                                 key 8   ▓ - By pressing key F6
▓ - By pressing the control key and key 9   ▓ - By pressing key F7
▓ -                                 key 0   ▓ - By pressing key F8
```

INSIDE BASIC

64 ROM routines

Last month we described the memory location below Basic programming memory. Here, as promised, is an explanation of the ROM routines completing the memory map for the 64.

A000; ROM control vectors
A00C; Keyword action vectors
A052; Function vectors
A080; Operator vectors
A09E; Keywords
A19E; Error messages
A328; Error message vectors
A365; Misc messages
A38A; Scan stack for FOR/GOSUB
A3B8; Move memory
A3FB; Check stack depth
A408; Check memory space
A435; ‘out of memory’
A437; Error routine
A469; BREAK entry
A474; ‘ready’
A480; Ready for Basic
A49C; Handle new line
A533; Re-chain lines
A560; Receive input line
A579; Crunch tokens
A613; Find Basic line
A642; Perform [NEW]
A65E; Perform [CLR]
A68E; Back up text pointer
A69C; Perform [LIST]
A742; Perform [FOR]
A7ED; Execute statement
A81D; Perform [RESTORE]
A82C; Break
A82F; Perform [STOP]
A831; Perform [END]
A857; Perform [CONT]
A871; Perform [RUN]
A883; Perform [GOSUB]
A8A0; Perform [GOTO]
A8D2; Perform [RETURN]
A8F8; Perform [DATA]
A906; Scan for next statement
A928; Perform [IF]
A93B; Perform [REM]
A94B; Perform [ON]
A96B; Get fixed point number
A9A5; Perform [LET]
AA80; Perform [PRINT#]
AA86; Perform [CMD]
AAA0; Perform [PRINT]
AB1E; Print string from (y.a)
AB3B; Print format character
AB4D; Bad input routine
AB7B; Perform [GET]
ABA5; Perform [INPUT#]
ABBF; Perform [INPUT]
ABF9; Prompt & input
AC06; Perform [READ]
ACFC; Input error messages
AD1E; Perform [NEXT]
AD78; Type match check
AD9E; Evaluate expression
AEA8; Constant – pi
AEF1; Evaluate within brackets
AEF7; ‘)’
AEFF; comma
AF08; Syntax error
AF14; Check range
AF28; Search for variable
AFA7; Setup FN reference
AFE6; Perform [OR]
AFE9; Perform [AND]
B016; Compare
B081; Perform [DIM]
B08B; Locate variable
B113; Check alphabetic
B11D; Create variable

INSIDE BASIC

B194; Array pointer subrtine
B1A5; Value 32768
B1B2; Float-fixed
B1D1; Set up array
B245; 'bad subscript'
B248; 'illegal quantity'
B34C; Compute array size
B37D; Perform [FRE]
B391; Fix-float
B39E; Perform [POS]
B3A6; Check direct
B3B3; Perform [DEF]
B3E1; Check fn syntax
B3F4; Perform [FN]
B465; Perform [STR$]
B475; Calculate string vector
B487; Set up string
B4F4; Make room for string
B526; Garbage collection
B5BD; Check salvageability
B606; Collect string
B63D; Concatenate
B67A; Build string to memory
B6A3; Discard unwanted string
B6DB; Clean descriptor stack
B6EC; Perform [CHR$]
B700; Perform [LEFT$]
B72C; Perform [RIGHT$]
B737; Perform [MID$]
B761; Pull string parameters
B77C; Perform [LEN]
B782; Exit string-mode
B78B; Perform [ASC]
B79B; Input byte parameter
B7AD; Perform [VAL]
B7EB; Parameters for POKE/WAIT
B7F7; Float-fixed
B80D; Perform [PEEK]
B824; Perform [POKE]
B82D; Perform [WAIT]
B849; Add 0.5
B850; Subtract-from
B853; Perform [subtract]
B86A; Perform [add]
B947; Complement FAC#1
B97E; 'overflow'
B983; Multiply by zero byte
B9EA; Perform [LOG]
BA2B; Perform [multiply]
BA59; Multiply-a-bit
BA8C; Memory to FAC#2
BAB7; Adjust FAC#1/#2
BAD4; Underflow/overflow
BAE2; Multiply by 10
BAF9; + 10 in floating pt
BAFE; Divide by 10
BB12; Perform [divide]
BBA2; Memory to FAC#1
BBC7; FAC#1 to memory
BBFC; FAC#2 to FAC#1
BC0C; FAC#1 to FAC#2
BC1B; Round FAC#1
BC2B; Get sign
BC39; Perform [SGN]
BC58; Perform [ABS]
BC5B; Compare FAC#1 to mem
BC9B; Float-fixed
BCCC; Perform [int]
BCF3; String to FAC
BD7E; Get ascii digit
BDC2; Print 'IN...'
BDCD; Print line number
BDDD; Float to ascii
BF16; Decimal constants
BF3A; TI constants
BF71; Perform [SQR]
BF7B; Perform [power]
BFB4; Perform [negative]
BFED; Perform [EXP]
E043; Series eval 1
E059; Series eval 2
E097; Perform [RND]
E0f9; ?? breakpoints ??
E12A; Perform [SYS]
E156; Perform [SAVE]
E165; Perform [VERIFY]
E168; Perform [LOAD]
E1BE; Perform [OPEN]
E1C7; Perform [CLOSE]
E1D4; Parameters for LOAD/SAVE
E206; Check default parameters
E20E; Check for comma
E219; Parameters for open/close
E264; Perform [COS]
E26B; Perform [SIN]
E2B4; Perform [TAN]
E30E; Perform [ATN]
E37B; Warm restart
E394; Initialize
E3A2; CHRGET for zero page
E3BF; Initialize Basic
E447; Vectors for $300
E453; Initialize vectors
E45F; Power-up message

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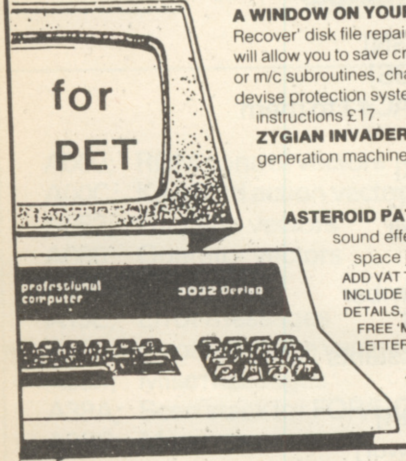

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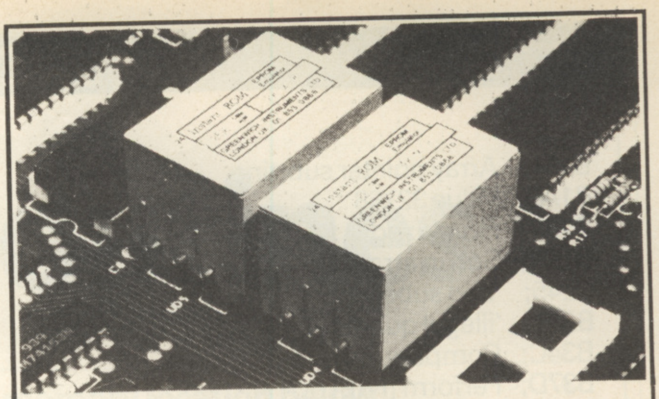

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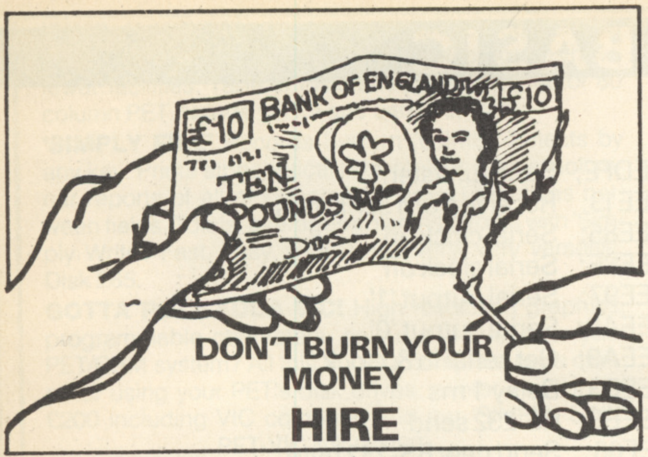
E500; Get I/O address
E505; Get screen size
E50A; Put/get row/column
E518; Initialize I/O
E544; Clear screen
E566; Home cursor
E56C; Set screen pointers
E5A0; Set 1/0 defaults
E5B4; Input from keyboard
E632; Input from screen
E684; Quote test
E691; Setup screen print
E6B6; Advance cursor
E6ED; Retreat cursor
E701; Back into previous line
E716; Output to screen
E87C; Got to next line
E891; Perform <return>
E8A1; Check line decrement
E8B3; Check line increment
E8CB; Set colour code
E8DA; Colour code table
E8EA; Scroll screen
E965; Open space on screen
E9C8; Move a screen line
E9E0; Synchronize colour transfer
E9F0; Set start-of-line
E9FF; Clear screen line
EA13; Print to screen
EA24; Synchronize colour pointer
EA31; Interrupt – clock etc
EA87; Read keyboard
EB79; Keyboard select vectors
EB81; Keyboard 1 – unshifted
EBC2; Keyboard 2 – shifted
EC03; Keyboard 3 – 'comm'
EC44; Graphics/text contrl
EC4F; Set graphics/text mode
EC78; Keyboard 4
ECB9; Video chip setup
ECE7; Shift/run equivalent
ECF0; Screen In address low
ED09; Send 'talk'
ED0C; Send 'listen'
ED40; Send to serial bus
EDB2; Serial timeout
EDB9; Send listen SA
EDBE; Clear ATN
EDC7; Send talk SA
EDCC; Wait for clock
EDDD; Send serial deferred
EDEF; Send 'untalk'
EDFE; Send 'unlisten'
EE13; Receive from serial bus
EE85; Serial clock on
EE8E; Serial clock off
EE97; Serial output '1'
EEA0; Serial output '0'
EEA9; Get serial in & clock
EEB3; Delay 1 ms
EEBB; RS-232 send
EF06; Send new RS-232 byte
EF2E; No-DSR error
EF31; No-CTS error
EF3B; Disable timer
EF4A; Compute bit count
EF59; RS232 receive
EF7E; Setup to receive
EFC5; Receive parity error
EFCA; Receive overflow
EFCD; Receive break
EFD0; Framing error
EFE1; Submit to RS232
F00D; No-DSR error
F017; Send to RS232 buffer
F04D; Input from RS232
F086; Get from RS232
F0A4; Check serial bus idle
F0BD; Messages
F12B; Print if direct
F13E; Get…
F14E; …from RS232
F157; Input
F199; Get… tape/serial/rs232
F1CA; Output…
F1DD; …to tape
F20E; Set input device
F250; Set output device
F291; Close file
F30F; Find file
F31F; Set file values
F32F; Abort all files
F333; Restore default I/O
F34A; Do file open
F3D5; Send SA
F409; Open RS232
F49E; Load program
F5AF; 'searching'
F5C1; Print filename
F5D2; 'loading/verifying'
F5DD; Save program
F68F; Print 'saving'
F69B; Bump clock
F6BC; Log PIA key reading



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F7EA; Find specific header
F80D; Bump tape pointer
F817; 'press play...'
F82E; Check tape status
F838; 'press record...'
F841; Initiate tape read
F864; Initiate tape write
F875; Common tape code
F8D0; Check tape stop
F8E2; Set read timing
F92C; Read tape bits
FA60; Store tape chars
FB8E; Reset pointer
FB97; New character setup
FBA6; Send transition to tape
FBC8; Write data to tape
FBCD; IRQ entry point
FC57; Write tape leader
FC93; Restore normal IRQ
FCB8; Set IRQ vector
FCCA; Kill tape motor
FCD1; Check r/w pointer
FCDB; Bump r/w pointer
FCE2; Power reset entry
FD02; Check 8-rom
FD10; 8-rom mask
FD15; Kernal reset
FD1A; Kernal move
FD30; Vectors
FD50; Initialize system constnts
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FDA3; Initialize I/O
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FE18; Flag status
FE1C; Set status
FE21; Set timeout
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FE27; Read top of memory
FE2D; Set top of memory
FE34; Read/set bottom of memory
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FE66; Warm start
FEB6; Reset IRQ & exit
FEBC; Interrupt exit
FEC2; RS-232 timing table
FED6; NMI RS-232 in
FF07; NMI RS-232 out
FF43; Fake IRQ
FF48; IRQ entry
FF81; Jumbo jump table
FFFA; Hardware vectors

Address	Effect
FF84	Initialise I/O
FF87	Initialise System Constants
FF8A	Kernal Reset
FF8D	Kernal Move
FF90	Flag Status
FF93	Send Listen SA
FF96	Send Talk SA
FF99	Read/Set top of memory
FF9C	Read/Set bottom of memory
FF9F	Read Keyboard
FFA2	Set Timeout
FFA5	Receive From Serial
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Tear down the wall

In this month's Basic Programming, we have two programs for the 64 and one for the VIC. For the 64 there is an implementation of the old arcade game Breakout, and a program that displays the time on the screen using Sprites for the numerals. For the VIC we have a graphics generator.

```
10 REM BREAKOUT
20 REM ***************************************
30 REM
40 GOTO1160
50 REM
60 REM
70 GOSUB1050
80 POKE53280,4:POKE53281,0:P=8:BA=5
90 REM
100 REM DISPLAY
110 REM
115 S$=CHR$(160)
120 PRINT"▯▓▨ ______________________________";
121 PRINT"____________________"S$;
130 FORI=1TO23
140 PRINT"▒▨ ▀▐";
141 FORJ=1TO37:PRINT" ";:NEXT
149 PRINT"▒▨"S$"▀▐█████ "
150 NEXT
160 PRINT"▒▨ ▀▐";
161 FORI=1TO37:PRINTS$;:NEXT
169 PRINT"▒▨"S$"▀▐█████"S$"▨"
170 PRINT"▨▩▩▩":A$="▨┬┬┬┬┬┬┬┬┬┬┬┐"
175 A$=A$+"┌┬┬┬┬┬┬┬┬┬┬┬┐"
180 PRINT"▮▩"A$:PRINT"▮▮"A$
190 PRINT"▮▧"A$:PRINT"▮▮"A$
200 PRINT"▮▦"A$:PRINT"▮▮"A$
210 PRINT"▮▤"A$:PRINT"▮▮"A$
220 A(1)=126:A(2)=108
230 A(3)=123:A(4)=124:R=0:O=0:V=41:Y=1
240 REM
250 REM RANDOM BALL START POSITION
260 REM AND DIRECTION
270 REM
280 Z=1505+INT(RND(1)*38)
290 G=INT(RND(1)*2)
300 IFG=1THENR=1
```

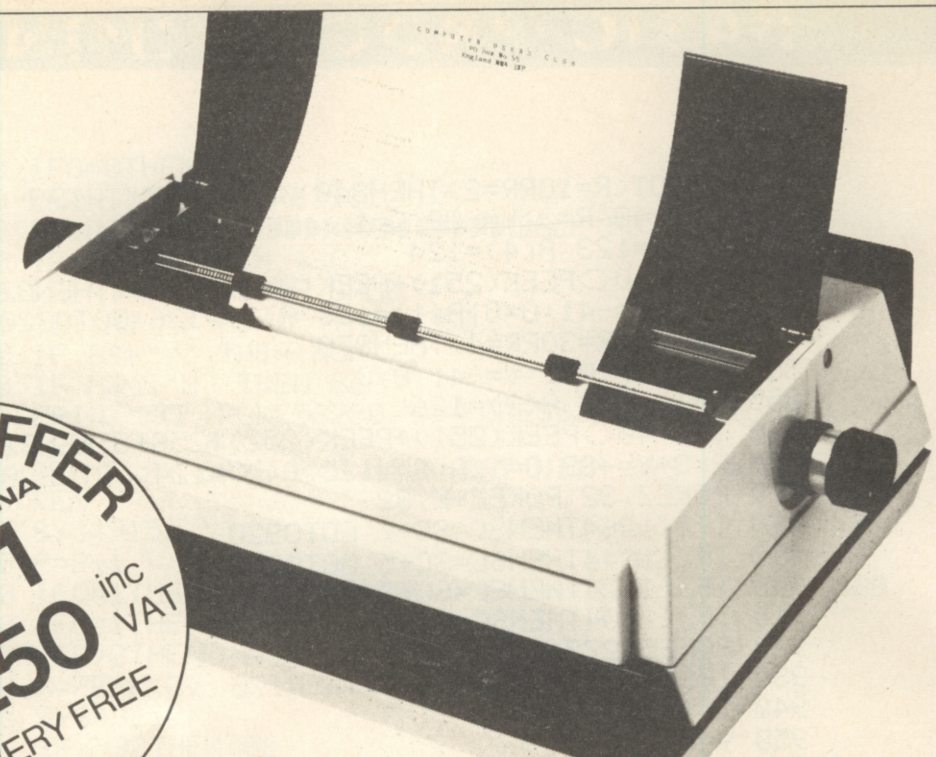
Breakout:

A nice version of the popular arcade game 'Breakout'. This game incorporates sound and the ability to send the ball back in the direction it came using the edge of the bat. The bat is controlled with a small machine code routine entered into memory. The machine code routine reads the keyboard and if it is a cursor key (direction control) it will move the bat in that direction.

When a ball has gone out, pressing the space bar will release the next ball. When a screen is cleared, a new screen will be displayed and the ball will start at a random point.

```
310 IFG=0THENR=3
320 PRINT"▓▓▓▓SCORE"SC
330 PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓BALL NO"BA
340 IF BA<>0 THEN 430
350 PRINT"▓▓ANOTHER GAME ?";
360 GET A$:IF A$="" THEN 360
370 IF A$="Y" THEN RUN
380 IF A$<>"N" THEN 360
390 PRINT"▓▓":POKE53280,14:POKE53281,6:END
400 REM
410 REM PLAY GAME AND MOVE BAT WITH SYS 49152
420 REM
430 SYS49152
440 R=R+1
450 IFO=1THENIFR>4THENR=3:Z=Z+V:POKEZ-V,32:GOTO480
460 IFO=1THEN480
470 IFR>2THENR=1:Z=Z+V:POKEZ-V,32
480 X=PEEK(Z)
485 SYS49152
486 IFX=32THEN580
490 IFX=120THENGOTO1300
500 IFX=207THENK= 1:GOTO1310
510 IFX=208THENK=-1:GOTO1310
520 IFX=160THENGOSUB1320:GOTO660
530 IFX=224THENGOSUB1320:GOTO730
540 IFX=228THENGOSUB1320:GOTO590
550 IFX<>96THEN580
560 BA=BA-1:POKES+18,129:POKES+18,128
570 GETA$:IFA$<>" "THEN570
575 GOTO220
580 POKEZ,A(R):GOTO430
590 Y=1
600 IFNOT(R=1ORR=2)THEN630
610 Z=Z+40:R=3:V=39:O=1
620 A(3)=124:A(4)=123:GOTO430
630 IFNOT(R=3ORR=4)THEN660
640 Z=Z+40:R=1:V=41:O=0
650 A(1)=126:A(2)=108:GOTO430
660 REM
670 IFNOT(R=1ORR=2)THEN700
680 Z=Z+1:R=3:V=-39:O=1
690 A(3)=123:A(4)=124:GOTO430
700 IFNOT(R=3ORR=4)THEN730
710 Z=Z+1:R=1:V=41:O=0
720 A(1)=126:A(2)=108:GOTO430
730 REM
740 IFNOT(R=1ORR=2)THEN770
750 Z=Z-1:R=3:V=39:O=1
760 A(3)=124:A(4)=123:GOTO430
770 IFNOT(R=3ORR=4)THEN800
780 Z=Z-1:R=1:V=-41:O=0
790 A(1)=108:A(2)=126:GOTO430
```

```
800 Y=0
810 IFNOT(R=1ORR=2)THEN840
820 Z=Z-40:R=3:V=-39:O=1
825 A(3)=123:A(4)=124
830 IFZ+40<>PEEK(251)+PEEK(252)*256+1THEN320
835 R=1:V=-41:O=0:A(1)=108:A(2)=126:GOTO320
840 IFNOT(R=3ORR=4)THEN870
850 Z=Z-40:R=1:V=-41:O=0
855 A(1)=108:A(2)=126
860 IFZ+40<>PEEK(251)+PEEK(252)*256+3THEN320
865 R=3:V=-39:O=1:A(3)=123:A(4)=124:GOTO320
870 POKEZ,32:POKEZ+K,32
880 IFZ<1264THENSC=SC+7:GOTO920
890 IFZ<1344THENSC=SC+5:GOTO920
900 IFZ<1424THENSC=SC+3:GOTO920
910 IFZ<1504THENSC=SC+1
920 POKE54272+Z,1:POKE54272+Z+K,1
930 IFSC/608=INT(SC/608)THEN170
940 IFY=1THEN800
950 Y=1
960 IFNOT(R=1ORR=2)THEN990
970 Z=Z+40:R=3:V=39:O=1
980 A(3)=124:A(4)=123:GOTO320
990 IFNOT(R=3ORR=4)THEN1050
1000 Z=Z+40:R=1:V=41:O=0
1010 A(1)=126:A(2)=108:GOTO320
1020 REM
1030 REM INSTRUCTIONS
1040 REM
1050 POKE53280,2:POKE53281,2
1055 PRINT"▒▒           ***   64 BREAKOUT    ***"
1060 PRINTTAB(12)"▓▓YOU MOVE WITH :
1070 PRINTTAB(11)"▓▓↑CRSR↑ MOVE LEFT
1080 PRINTTAB(11)"▓←CRSR← MOVE RIGHT
1090 PRINTTAB(13)"▓▓▓HIT ANY KEY
1100 GETA$:IFA$=""THEN1100
1110 RETURN
1120 REM
1130 REM MACHINE CODE ROUTINE TO CHANGE
1140 REM POSITION OF THE BAT
1150 REM
1160 POKE251,208:POKE252,7
1180 FORI=49152TO49206
1190 READA:POKEI,A:NEXT:GOTO1280
1200 DATA165,197,201,2,208,11,164
1210 DATA251,192,227,240,37,230,251
1220 DATA76,29,192,201,7,208,28
1230 DATA164,251,192,192,240,22,198
1240 DATA251,160,4,185,50,192,145
1250 DATA251,136,16,248,169,160,141
1260 DATA192,7,169,224,141,231,7
1270 DATA96,96,120,120,120,96
```



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```
1280 S=54272:FORI=0TO24:POKES+I,0:NEXT
1281 POKES,135:POKES+1,33
1282 POKES+7,195:POKES+8,16
1283 POKES+14,97:POKES+15,8
1284 POKES+5,0:POKES+6,248
1285 POKES+12,0:POKES+13,248
1286 POKES+19,0:POKES+20,251
1287 POKES+4,16:POKES+11,16:POKES+18,128
1288 POKES+24,15
1289 GOTO50
1300 POKES+4,17:POKES+4,16:GOTO800
1310 POKES+11,17:POKES+11,16:GOTO870
1320 POKES+4,17:POKES+4,16:RETURN
READY.
```

```
10 REM DIGICLOCK USING SPRITES FOR THE
20 REM NUMBERS.
30 REM
100 GOSUB 31000:REM GET SPRITES
110 PRINT"▮PLEASE ENTER THE TIME IN THE FORMAT"
120 PRINT"      HHMMSS";
130 INPUTTA$
140 IF LEN(TA$)=6 THEN TI$=TA$
150 V=53248
160 FORI=0TO7
170 POKEV+I*2,(I*40+20)AND255
180 POKEV+I*2+1,130
220 POKEV+39+I,7
230 IFI=2ORI=5THENPOKEV+39+I,0
240 POKE2040+I,244
250 NEXT
260 POKEV+33,2
270 POKEV+32,0
280 POKEV+21,255
290 POKEV+23,255
300 POKEV+29,255
310 POKEV+16,0
320 POKE2042,255:POKE2045,255
330 POKEV+16,192
340 PRINT"▮▮QQQQQQQQQ  HOURS           ";
345 PRINT"MINS.            SECS."
350 PRINT" ─────           ";
355 PRINT"──────           ──────"
370 FORI=0TO7
380 IFI=2ORI=5THEN430
390 A=I+1:IFA>6THENA=A-1
400 IFA>3THENA=A-1
410 B=VAL(MID$(TI$,A,1))
420 POKE2040+I,B+245
430 NEXT
440 POKEV+44,0:CLR:T$=TI$:V=53248
```

Digiclock:

For all of you time-keepers out there, here is a program that displays the entered time (24 hour) onto the 64's screen with the use of enlarged Sprites. The data values at the end are for the ten numerals and the large colon(:).

```
450 IFTI$=T$THEN450
460 POKEV+44,2:GOTO370
30000 DATA246
30001 DATA0,0,0,0,0,0,0
30002 DATA0,0,0,0,0,0,28
30003 DATA0,0,36,0,0,68,0
30004 DATA0,132,0,1,4,0,1
30005 DATA100,0,1,164,0,0,36
30006 DATA0,0,36,0,0,36,0
30007 DATA0,36,0,0,36,0,0
30008 DATA36,0,0,36,0,1,231
30009 DATA128,1,0,128,1,255,128
30010 DATA247
30011 DATA0,0,0,0,0,0,0
30012 DATA0,0,0,0,0,0,126
30013 DATA0,0,129,0,1,60,128
30014 DATA2,66,64,2,66,64,2
30015 DATA66,64,3,194,64,0,4
30016 DATA128,0,9,0,0,18,0
30017 DATA0,36,0,0,72,0,0
30018 DATA144,0,1,32,0,2,127
30019 DATA192,2,0,64,3,255,192
30020 DATA248
30021 DATA0,0,0,0,0,0,0
30022 DATA0,0,0,0,0,0,124
30023 DATA0,0,130,0,1,57,0
30024 DATA2,68,128,2,68,128,3
30025 DATA196,128,0,4,128,0,9
30026 DATA0,0,18,0,0,9,0
30027 DATA0,4,128,3,196,128,2
30028 DATA68,128,2,68,128,1,57
30029 DATA0,0,130,0,0,124,0
30030 DATA249
30031 DATA0,0,0,0,0,0,0
30032 DATA0,0,0,0,0,0,15
30033 DATA0,0,17,0,0,33,0
30034 DATA0,73,0,0,153,0,1
30035 DATA41,0,2,73,0,4,137
30036 DATA0,4,249,224,4,0,32
30037 DATA7,249,224,0,9,0,0
30038 DATA9,0,0,9,0,0,9
30039 DATA0,0,9,0,0,15,0
30040 DATA250
30041 DATA0,0,0,0,0,0,0
30042 DATA0,0,0,0,0,3,255
30043 DATA192,2,0,64,2,127,192
30044 DATA2,64,0,2,64,0,2
30045 DATA64,0,2,126,0,2,1
30046 DATA0,3,252,128,0,2,64
30047 DATA0,2,64,0,2,64,3
30048 DATA194,64,2,66,64,1,60
30049 DATA128,0,129,0,0,126,0
30050 DATA251
30051 DATA0,0,0,0,0,0;0
30052 DATA0,0,0,0,0,0,127
30053 DATA0,0,128,128,1,62,64
30054 DATA2,65,192,2,64,0,2
30055 DATA64,0,2,64,0,2,126
30056 DATA0,2,1,0,2,60,128
30057 DATA2,66,64,2,66,64,2
30058 DATA66,64,2,66,64,1,60
30059 DATA128,0,129,0,0,126,0
30060 DATA252
30061 DATA0,0,0,0,0,0,0
30062 DATA0,0,0,0,0,3,255
30063 DATA192,2,0,64,3,254,64
30064 DATA0,2,64,0,2,64,0
30065 DATA4,128,0,4,128,0,9
30066 DATA0,0,9,0,0,18,0
30067 DATA0,18,0,0,36,0,0
30068 DATA36,0,0,72,0,0,72
30069 DATA0,0,144,0,0,240,0
30070 DATA253
30071 DATA0,0,0,0,0,0,0
30072 DATA0,0,0,0,0,0,124
30073 DATA0,0,130,0,1,57,0
30074 DATA2,68,128,2,68,128,2
30075 DATA68,128,2,68,128,1,57
30076 DATA0,0,130,0,1,57,0
30077 DATA2,68,128,2,68,128,2
30078 DATA68,128,2,68,128,1,57
30079 DATA0,0,130,0,0,124,0
30080 DATA254
30081 DATA0,0,0,0,0,0,0
30082 DATA0,0,0,0,0,0,126
30083 DATA0,0,129,0,1,60,128
30084 DATA2,66,64,2,66,64,2
30085 DATA66,64,2,66,64,1,60
30086 DATA64,0,128,64,0,126,64
30087 DATA0,2,64,0,2,64,0
30088 DATA2,64,3,130,64,2,124
30089 DATA128,1,1,0,0,254,0
30090 DATA245
30091 DATA0,0,0,0,0,0,0
30092 DATA0,0,0,0,0,0,255
30093 DATA0,1,0,128,2,126,64
30094 DATA4,129,32,4,130,32,4
30095 DATA132,32,4,137,32,4,147
30096 DATA32,4,165,32,4,201,32
30097 DATA4,145,32,4,33,32,4
30098 DATA65,32,4,129,32,2,126
30099 DATA64,1,0,128,0,255,0
30100 DATA255
30101 DATA0,0,0,0,0,0,0
30102 DATA0,0,0,0,0,0;60
30103 DATA0,0,126,0,0,126,0
```

```
30104 DATA0,126,0,0,126,0,0
30105 DATA60,0,0,0,0,0,0
30106 DATA0,0,0,0,0,0,0
30107 DATA0,0,0,0,60,0,0
30108 DATA126,0,0,126,0,0,126
30109 DATA0,0,126,0,0,60,0
30110 DATA-1
31000 READA:IFA=-1THEN31040
31010 FORI=0TO62:READX
31020 POKE64*A+I,X:NEXT
31030 GOTO31000
31040 FORI=0TO62:POKE244*64+I,0:NEXT
31050 RETURN
READY.
```

```
0 REM NOTE:                          THIS PROGRAM          USES 3528 BYTES
1 GOSUB7500
2 GOSUB9000
3 GOSUB7000
5 Z=0:Y=0:X=0:W=0:V=0:U=0:T=0:S=0
10 PRINT"▚▩▩▩▩▩▩▶▶▶▶▶▶1▩2▬3▩4▬5▩6▬7▩8▬"
20 PRINT"▶▶▶▶▶▶L__________"
30 PRINT"▶▶▶▶1 |          | "
40 PRINT"▶▶▶▶▩2▬ |          | "
50 PRINT"▶▶▶▶3 |          | "
60 PRINT"▶▶▶▶▩4▬ |          | "
70 PRINT"▶▶▶▶5 |          | "
80 PRINT"▶▶▶▶▩6▬ |          | "
90 PRINT"▶▶▶▶7 |          | "
100 PRINT"▶▶▶▶▩8▬ |          | "
110 PRINT"▶▶▶▶▶▶┌‾‾‾‾‾‾‾‾‾‾"
200 A=38560:B=7840
210 POKEA,0:POKEB,86
220 GETA$
240 IFPEEK(B+1)<>32ORPEEK(B+1)=160THENGOTO260
250 IFA$="▶"THENA=A+1:B=B+1:POKEB-1,32
260 IFPEEK(B-1)<>32ORPEEK(B-1)=160THENGOTO280
270 IFA$="◀"THENA=A-1:B=B-1:POKEB+1,32
280 IFPEEK(B-22)<>32ORPEEK(B-22)=160THENGOTO300
290 IFA$="▲"THENA=A-22:B=B-22:POKEB+22,32
300 IFPEEK(B+22)<>32ORPEEK(B+22)=160THENGOTO320
310 IFA$="▩"THENA=A+22:B=B+22:POKEB-22,32
320 IFA$=" "THENGOTO1000
330 PRINT"▩▩TO FILL IN LAST SQUARE▩      PRESS 'G'"
335 PRINT"▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩▩";
340 PRINT"PRESS CLRHOME TO REDO▩▩PRESS 'F' TO FINISH   ▩PRESS SPACE TO CREATE"
360 IFA$="▩"THEN3
361 IFA$="■"THENGOSUB6000
362 IFA$="▬"THENGOSUB6500
363 IFA$="▮"THENGOSUB6600
364 IFA$="▮"THENGOSUB6700
370 IFA$="G"THENPOKEB,160:GOTO8000
371 IFA$="F"THENGOTO8000
380 GOTO210
1000 IFPEEK(B+1)=32ANDPEEK(B+1)<>160THENA=A+1:B=B+1:POKEA-1,0:POKEB-1,160:GOTO33
0
```

Graphics Generator:
This program, written by Simon Reeves of West Sussex, gives the facility for drawing up characters on an 8×8 grid and when the drawing has been completed, it will give the data values for the character. These values can be noted and used in any program using user defined characters.

Instructions on how it is used are included in the program.

```
1010 IFPEEK(B-1)=32ANDPEEK(B-1)<>160THENA=A-1:B=B-1:POKEA+1,0:POKEB+1,160:GOTO33
0
1020 IFPEEK(B+22)=32ANDPEEK(B+22)<>160THENA=A+22:B=B+22:POKEA-22,0:POKEB-22,160:
GOTO330
1030 IFPEEK(B-22)=32ANDPEEK(B-22)<>160THENA=A-22:B=B-22:POKEA+22,0:POKEB+22,160:
GOTO330
5000 GOTO330
6000 IFPEEK(B-22)=160THENPOKEB-22,32:RETURN
6010 RETURN
6500 IFPEEK(B+22)=160THENPOKEB+22,32:RETURN
6510 RETURN
6600 IFPEEK(B-1)=160THENPOKEB-1,32:RETURN
6610 RETURN
6700 IFPEEK(B+1)=160THENPOKEB+1,32:RETURN
6710 RETURN
7000 PRINT"♥▒  USE THESE KEYS FOR    CERTAIN FUNCTIONS":PRINT"▒▒USE CRSR KEYS TO
 MOVE"
7010 PRINT"▒▒CLRHOME TO START AGAIN"
7020 PRINT"▒▒▒F1-DELETE BLOCK ABOVE ";
7030 PRINT"F3-DELETE BLOCK BELOW ";
7040 PRINT"F5-DELETE BLOCK BEHIND";
7050 PRINT"F7-DELETE BLOCK BEFORE";
7060 PRINT"▒▒▒    PRESS T"
7070 GETAA$:IFAA$=""THEN7070
7080 IFAA$<>"T"THENGOTO7070
7090 RETURN
7500 REM
7505 PRINT"♥":PRINT"▒▒▒▒▒▒  GRAPHICS GENERATOR"
7510 PRINT"▒▒   BY SIMON  REEVES"
7520 PRINT"▒▒▒▒▒▒▒▒     PRESS A KEY":POKE198,0:WAIT198,1:POKE198,0:RETURN
8000 ZA=128
8010 FORYA=7840TO7847
8020 IFPEEK(YA)=160THENZ=Z+ZA
8030 IFZA=1THENGOTO8060
8040 ZA=ZA/2
8050 NEXTYA
8060 ZA=128
8070 FORYA=7862TO7869
8080 IFPEEK(YA)=160THENY=Y+ZA
8090 IFZA=1THENGOTO8120
8100 ZA=ZA/2
8110 NEXTYA
8120 ZA=128
8130 FORYA=7884TO7891
8140 IFPEEK(YA)=160THENX=X+ZA
8150 IFZA=1THENGOTO8180
8160 ZA=ZA/2
8170 NEXTYA
8180 ZA=128
8190 FORYA=7906TO7913
8200 IFPEEK(YA)=160THENW=W+ZA
8210 IFZA=1THENGOTO8240
8220 ZA=ZA/2
8230 NEXTYA
8240 ZA=128
8250 FORYA=7928TO7935
8260 IFPEEK(YA)=160THENV=V+ZA
8270 IFZA=1THENGOTO8300
8280 ZA=ZA/2
8290 NEXTYA
8300 ZA=128
8310 FORYA=7950TO7957
8320 IFPEEK(YA)=160THENU=U+ZA
8330 IFZA=1THENGOTO8360
8340 ZA=ZA/2
8350 NEXTYA
8360 ZA=128
8370 FORYA=7972TO7979
8380 IFPEEK(YA)=160THENT=T+ZA
```

```
8390 IFZA=1THENGOTO8420
8400 ZA=ZA/2
8410 NEXTYA
8420 ZA=128
8430 FORYA=7994TO8001
8440 IFPEEK(YA)=160THENS=S+ZA
8450 IFZA=1THENGOTO8700
8460 ZA=ZA/2
8470 NEXTYA
8700 PRINT"■":PRINT"■■■■■YOUR DATAS ARE"
8710 PRINT"■■■DATA";Z"■,";Y;"■,";X;"■,";W;"■,";V;"■,";U;"■,";T;"■,";S
8720 PRINT"■■■■ PRESS T TO CONTINUE"
8730 PRINT"■ PRESS E TO ESCAPE"
8740 GETAA$:IFAA$=""THEN8740
8750 IFAA$="T"THENGOTO3
8760 IFAA$="E"THEN9999
8770 IFAA$<>"T"ORAA$<>"E"THENGOTO8740
9000 PRINT"■■■  GRAPHICS GENERATOR"
9010 PRINT"■■┌─────────────────────"
9020 PRINT"■■THIS PROGRAM WORKS OUTDATAS FOR USER-DEFINEDCHARACTERS."
9030 PRINT"■USING THE SPACE BAR   YOU DRAW A SHAPE IN   THE 8 × 8 BOX ON THE  SC
REEN; ";
9040 PRINT"AS THOUGH YOU WERE DRAWING IT ON A  PIECE OF GRAPH PAPER."
9045 PRINT"■■■■■■■■■PRESS A KEY"
9046 POKE198,0:WAIT198,1:POKE198,0:PRINT"■■■  GRAPHICS GENERATOR    ───────────
──────────"  "

9050 PRINT"■YOU MOVE AN 'X' AROUNDTHE BOX AND BY USING  CERTAIN KEYS YOU CAN  CR
EATE ";
9060 PRINT"A BLOCK AS ON  GRAPH PAPER AND DELETEWHEN NOT REQUIRED."
9080 PRINT"■■■■ TO SEE WHICH KEYS TO■          USE:■             PRESS ANY KEY."
9100 POKE198,0:WAIT198,1:POKE198,0:PRINT"■":RETURN
9999 PRINT"■":END

READY.
```

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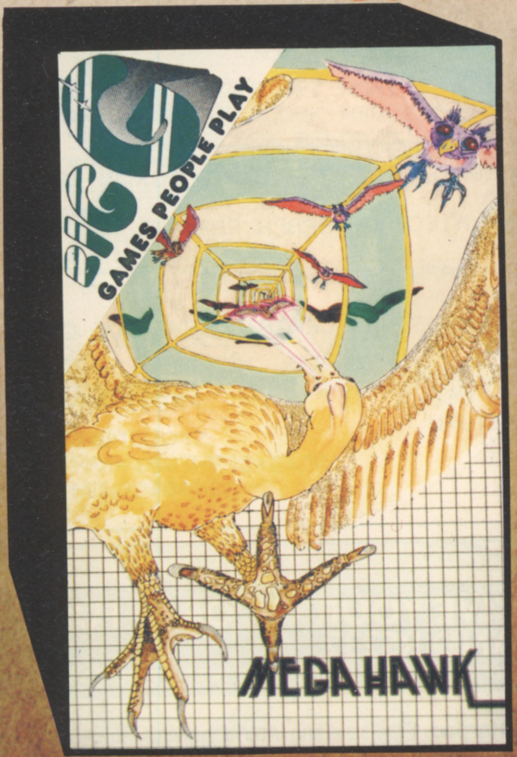

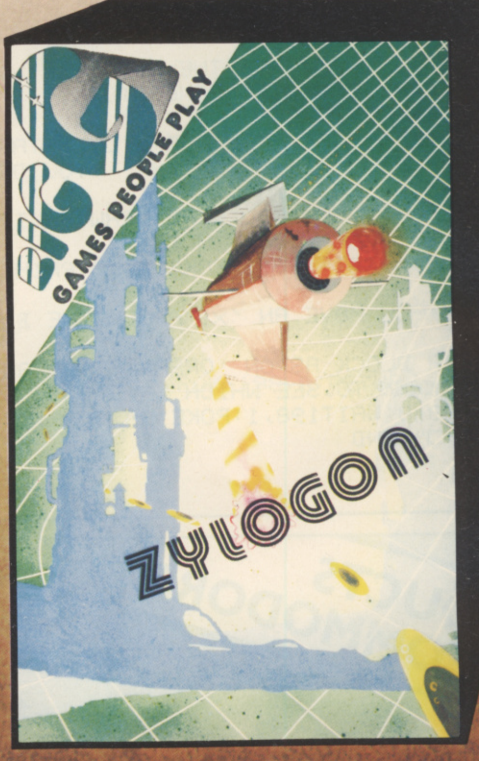

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VIC chip revealed

With the recent announcement by Commodore of their graphics competition, we take an in-depth look at the Commodore 64's VIC (Video Interface Controller) chip.

All graphics on the 64 are controlled using the 47 registers in the VIC chip. These registers control effects ranging from border and screen colour to complicated use of the raster interrupts.

The easiest format for using the VIC chip is to set a variable VIC=53248 and POKE to locations VIC+reg no.

We will now take a thorough look at each register.

Register No.	**Use**
0	Sprite 0 x position (0-255). Note with the x position, the high bit (i.e. values greater than 255) are controlled by register 16.
1	Sprite 0 y position (0-255).
2	Sprite 1 x.
3	Sprite 1 y.
4	Sprite 2 x.
5	Sprite 2 y.
6	Sprite 3 x.
7	Sprite 3 y.
8	Sprite 4 x.
9	Sprite 4 y.
10	Sprite 5 x.
11	Sprite 5 y.
12	Sprite 6 x.
13	Sprite 6 y.
14	Sprite 7 x.
15	Sprite 7 y.
16	MSBit of Sprite x position. Each bit corresponds to one of the 8 Sprites.

An example of how to put a Sprite co-ordinate into the appropriate registers is:

```
SP=Sprite no. (0-7)

X=x coord.

Y=y coord. (0-255)

VIC=53248

POKEVIC+SP*2+1,Y : REM Y COORD

POKEVIC+SP*2,XAND255 : REM X COORD

IFX>255THENPOKEVIC+16,PEEK(VIC+16)OR2(to the power of)SP

IFX<=255THENPOKEVIC+16,PEEK(VIC+16)AND(255-2(to the power of)SP)
```

17 VIC control register.

Bit 7 Raster compare MSBit.

6 Extended colour mode:
1 to enable
0 to disable

5 Bit-map mode:
1 to enable
0 to disable

4 Blank screen to border colour:
0 to blank
1 to restore

3 Select 24/25 row screen:
1=25 rows
2-0 Smooth scroll vertical.

To smooth scroll to a vertical position (I=0 to 7) use command:

```
POKEVIC+17,(PEEK(VIC+17)AND248)ORI
```

18 Raster compare LSByte.

19 Light-pen X position.

20 Light-pen Y position.

To read the light pen co-ordinates requires PEEKing the two locations into variables x and y. There is a conversion required to get the true value (in terms of the hi-res screen). These conversions are:

```
x=(x-xoff)*2:y=y-yoff
```

Note: The values xoff and yoff are the values returned for the x and y values at the top left corner of the screen. These values vary for the different light pens on the market.

21 Sprite enable. Each bit corresponds to one of the 8 Sprites. 1=Sprite enabled.

22 Another VIC control register.
Bit 7-6 Unused.

5 Always set to a zero (according to Programmers Reference Guide).

4 Multi-colour mode:
1 to enable
0 to disable
3 Select 38/40 column screen.
1=40 column.
2-0 Smooth scroll horizontally.

To smooth scroll to a horizontal position (I=0 to 7) use command:

```
POKEVIC+22,(PEEK(VIC+22)AND248)ORI
```

23 Sprite expand in the y direction. Each bit corresponds to one of the 8 Sprites. 1=expanded.

24 VIC memory control register.
Bits 4-7 Video matrix address.
0-3 Character data address.

25 VIC interrupt flag register.
Bit 7 Set on any interrupt produced by VIC chip.
3 Light pen IRQ. 1=occurred.
2 Sprite to sprite collision. 1 = occurred.
1 Sprite to background collision. 1=occurred.
0 Raster compare. 1=occurred.

When handling interrupts produced by the VIC chip, once they have been seen to, a 1 must be written to the correct bit to clear that interrupt.

26 IRQ enable register. Same bits as R25. 1=interrupt enabled.

27 Sprite to background priority. 0=Sprite in front.

28 Sprite Multi-colour mode. Each bit corresponds to one of the 8 Sprites. 1=Multi-colour.

29 Sprite expand in the x direction.

30 Sprite to Sprite collision register. Bits set correspond to the Sprites in collision.

31 Sprite to background collision register.

With registers 30 and 31, when read they are reset to zero.

32 Border colour.

33 Normal Background colour.

34 Optional colour 1.

35 Optional colour 2.

36 Optional colour 3.

The optional colours are used in extended or multi-colour character mode.

37 Sprite optional colour 1.

38 Sprite optional colour 2.

The sprite optional colours are used when Multi-colour Sprites are required. Note they will be the same for all 8 Sprites.

39 Sprite 0 colour.

40 Sprite 1 colour.

41 Sprite 2 colour.

42 Sprite 3 colour.

43 Sprite 4 colour.

44 Sprite 5 colour.

45 Sprite 6 colour.

46 Sprite 7 colour.

Now that we have covered all of the VIC chip registers, here is a brief explanation on how to produce Hi-res graphics.

For use of the VIC interrupts, we will refer you to the MARCH '84 Hints & Tips section.

Hi-Res graphics

Hi-resolution graphics are obtained by entering a mode called bit mapped mode (see register no. 17). This is done by:

```
POKEVIC+17,PEEK(VIC+17)OR32
```

When this mode has been entered, the area that the bit mapped screen is going to take up must be determined. This area will be 8000 bytes in size. As the VIC chip can only access 16K in one go, the best place to put it is at the top end of that 16K ie 8192.

This is chosen by:

```
POKEVIC+24,PEEK(VIC+24)OR8
```

If you have just done this, you should have a screen full of random dots in red on a black background. This is because the hi-res area is normally programming RAM and must be cleared.

To clear the hi-res area, use:

```
FORI=0TO7999:POKE8192+I,0:NEXT
```

The colour data for the plotted points are stored in 1K of RAM. This colour memory is located at the same place as the normal video screen ie 1024-2023.

To set the colour required, use:

```
SC=screen colour:PC=point colour
FORI=0TO999:POKE1024+I,SC+PC*16:NEXT
```

Now the 64 is set up to allow points to be plotted on it. The convention used in this article is that the x co-ordinates go from left to right with values between 0 and 319. The y values go down the screen (for ease of calculation) with values between 0 and 199.

To calculate the location in the bit mapped area corresponding to an x and y coordinate use:

```
BYTE=8192+INT(Y/8)*320+INT(X/8)*8+(YAND7)
```

Once this has been calculated, the actual bit (pixel) in that byte must be calculated. This is done by:

```
BIT=7-(XAND7)
```

To plot the point x,y to the hires screen, use:

```
POKEBYTE,PEEK(BYTE)OR2(to the power of)BIT
```

To unplot that point, use:

```
POKEBYTE,PEEK(BYTE)AND(255–2(to the power of)BIT)
```

If multi-colour graphics are required, the above procedures are nearly correct with just the difference of the colour storage and the bit.

Added to the methods, for multi-colour:

```
POKEVIC+22,PEEK(VIC+22)OR16
```

Which puts the computer into multi-colour mode.

There are a few modifications required to the previously explained routines. These are: for the colour storage, the video screen now holds two of the plotted point colours, the background(screen) colour is from the normal screen colour register (VIC+33) and a third point colour is obtained from the colour RAM (55296-56295).

The last point to note for multi-colour mode hi-res is that because of the increase in the number of colours. There is a decrease in the resolution. The resolution is now only 0-159 in the x direction although you must still work to the 0-319 co-ordinates. Therefore, the bit calculations will be slightly different as two bits are needed for each point. The new bit calculation is:

```
BIT=INT(7-(XAND7)/2)*2
```

This returns the lower of the 2 bits required to plot a point. The colour of the point depends on whether each or either of the bits is switched on or off.

bit	bit+1	colour from
0	0	Screen register (VIC+33)
0	1	Upper 4 bits of video RAM.
1	0	Lower 4 bits of video RAM.
1	1	Colour memory.

Where 1=turned on and 0=turned off.

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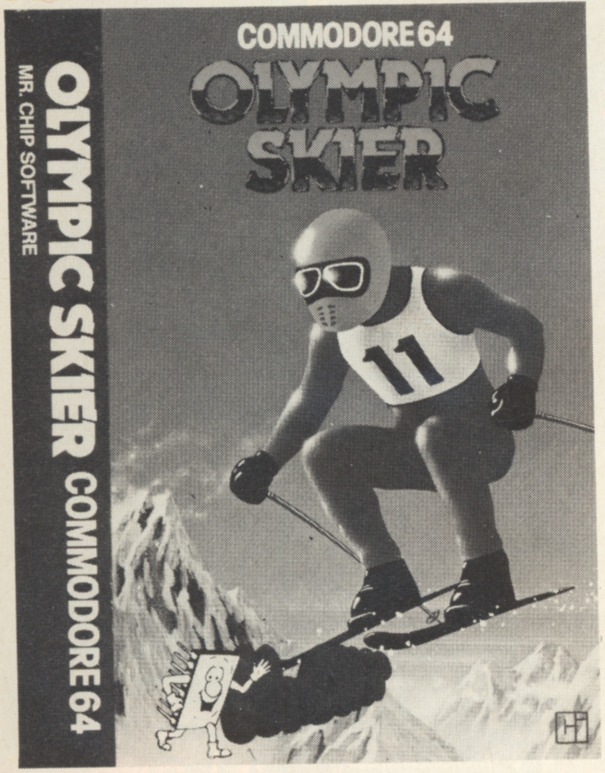
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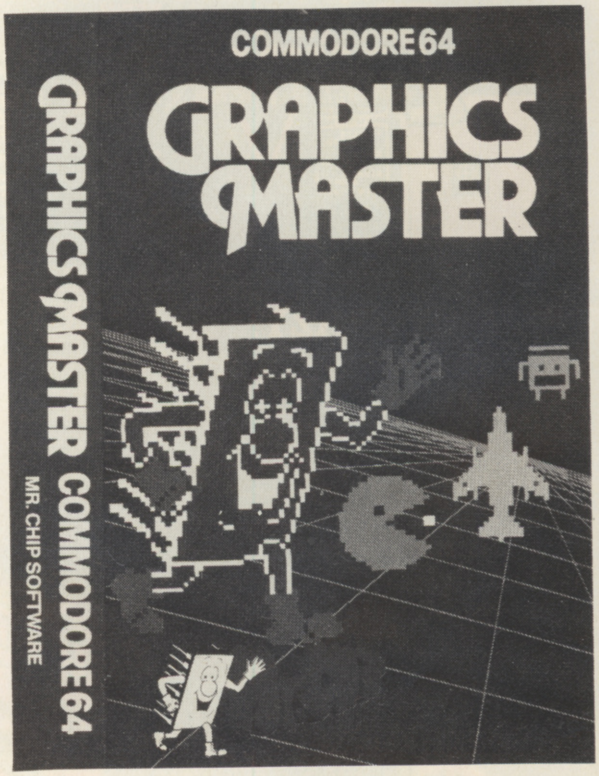
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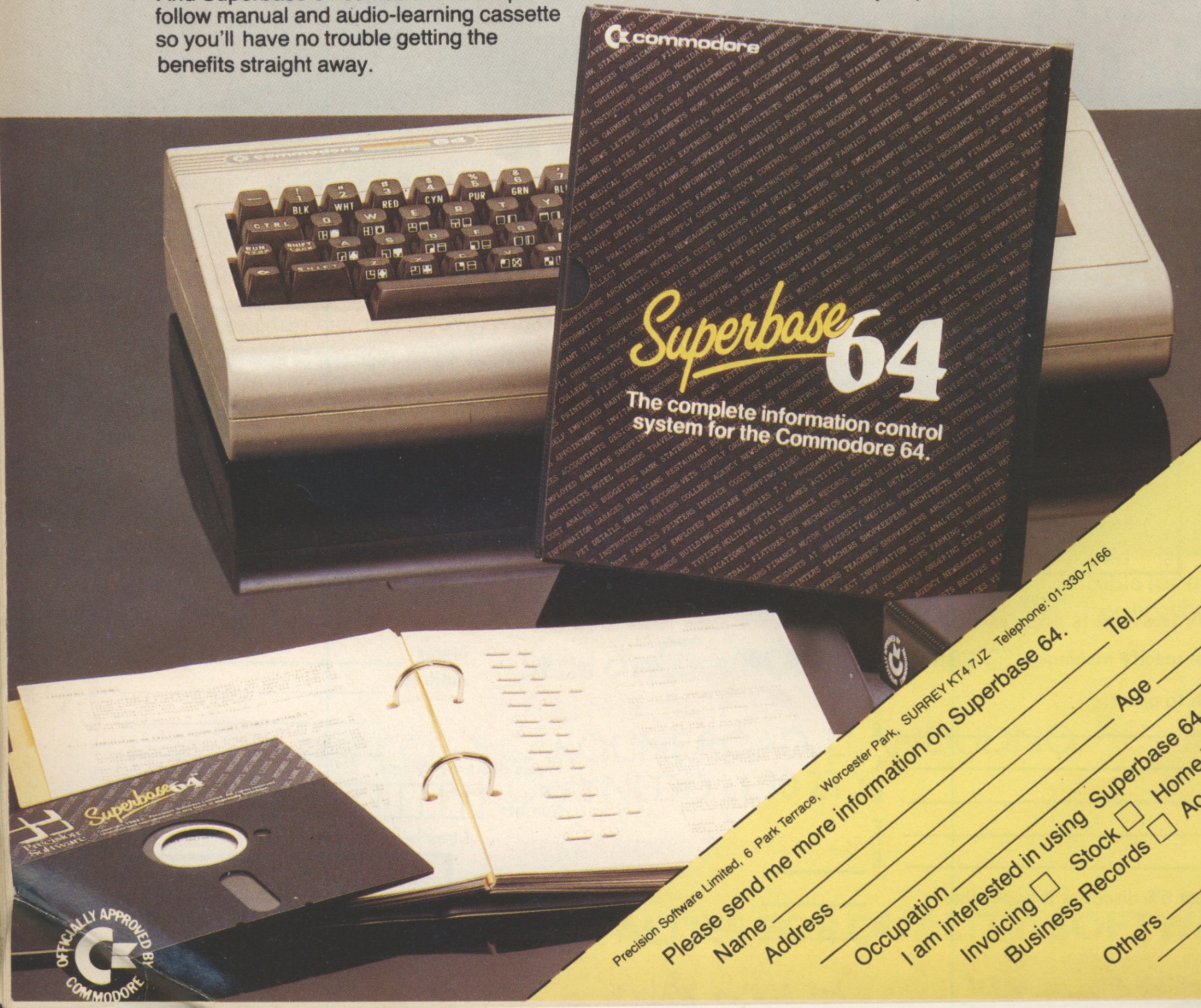
More information on Superbase 64 is available from Commodore Dealers, Major Retailers or from Precision Software direct.

From the authors of Easy Script.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Template

Solar Systems International have designed a product to make life much easier for the Visicalc user.

Learning to use a spreadsheet such as Visicalc can be a time consuming and difficult process. Planning the layout of a large template is difficult when only a few lines and columns are visible at any time on the VDU.

To eliminate the problem Solar Systems have produced a 81cm x 55cm grid with a wipe-clean surface for £5. This can be used to mark out the text and formulae for each entry and any project carried out on Visicalc can be planned in relation to the whole project.

Contact: Solar Systems International Ltd, 2nd Floor, Borough House, Rue de Pre, St Peter Port; Guernsey. Tel: 0481 64475.

Also producing templates for spreadsheets – Visicalc, SmartFiler Spreadsheet, and Calc Result – are Chase Revel Inc, publishers of Entrepreneur Magazine.

Contact: Entrepreneur, 2311 Pontius Avenue, Los Angeles, CA 90064. Tel: 213 478 0437.

Purchase ledger

Designed for the non-technical user, Anagram Systems have produced a new purchase ledger retailing at £75 for the CBM 64. It covers a wide range of business requirements.

Depending on information stored, up to 175 supplier accounts can be maintained with 50 nominal accounts having between four to 10 outstanding invoices per supplier. It can also be run with Anagrams' sales ledger package and stock control system.

Contact: Anagram Systems, 60a Queen Street, Horsham, West Sussex. Tel: 0403 59551.

Tidy solution

Keeping floppy disks and computer printouts clean and in tidy order can be a problem. Inmac and Stralfor Data Products' binders provide a solution to these problems.

A hinged binder which stands up like an easel and a more conventional lie-flat design are both used for storing floppy disks and cost £7.50 and £4.50 respectively.

Contact: Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Computer print outs can be stored in a ringbinder which takes listings up to 39 cm wide. These cost £2.15 each for a minimum order of 20.

Contact: Stralfor Data Products, 11 Techno Trading Estate, Swindon, Wilts. Tel: 0793 37837.

Multiple speed

The Mark 2 Microfacts accounting software for Commodore can now support multiple users sharing common data files on a Corvus Winchester disk drive.

This product is intended for existing users who want to upgrade Microfact and increase its speed and capacity. The original accounting system is supplied by Facts Software, but Michael Johnson & Co, developed this multi user version under licence and are supporting and installing the system.

Contact: M. Johnson & Co, 3 Orchard Road, Pulloxhill, Beds. Tel: 0525 714444.

All-in-one

Inmac, specialists in computer accessories, have launched a mobile works station designed to hold all your hardware requirements – keyboard, printer, computer, paper catch and paper feed.

Costing £285, this self contained unit has four wheels enabling mobility. Safety rails keep equipment relatively secure in transit. Cables are neatly tucked into slots and ducts, leaving only one mains plug and cable for connection. The work surface is 67cm high, 22cm wide and 76cm deep. Optional extras include drawers and a monitor shelf.

Contact: Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire WA7 1PZ. Tel: 09285 67551.

64 range

Batteries Included, a Canadian company, have produced a range of business orientated products for the CBM 64.

The Consultant, a database which they claim is 'powerful and big', allows the user to design a layout to file information. Data can be sorted, analysed, stored and in addition, in-built routines mail labels and forms can be printed.

The Buscard II is an updated version of the original Buscard and transforms the CBM 64 into a business computer. Using this device, most commodore compatible peripherals can be attached and will not be mismatched. It also gives the user extended Basic, ASCII and a full machine language monitor. Manual included.

The BI-80 column adaptor provides a wide column display to give optimum clarity to the CBM 64. It can be used with any monochrome video monitor and has the Basic 4.0 language.

Spellpack teaches the CBM 64 how to spell. The program checks a document for spelling errors in two to four minutes using its dictionary of over 20,000 words.

Contact: Batteries Included, 186 Queen Street, Toronto, Ontario, M5V 1Z1. Tel: 416 596 1405.

BC back

The original BC-Basic came from BC Computers and was available on cassette and disk. Kuma have now taken over the distribution and their new and slightly improved version comes on a cartridge for the CBM 64, at the increased price of £57.50.

See our review of BC Basic in November issue for further, details.

Contact: Kuma Computers Ltd, 12 Horseshoe Park, Pangbourne, Berks, RG8 7JW. Tel: 07357 4335.

BUSINESS SOFTWARE

The Midas touch

This month we look at SM Software's Golden Tool series of programs for the 64 which is aimed at general business users and those creating their own programs.

SM Software are originally a German company and are well known as suppliers of software – mainly business software – for the PET, Sirius and Epson computers. Now they have produced a series of programs for the 64 which they have chosen to call Golden Tool.

So far they have produced five pieces of software in the series, three aimed at serious users who are likely to be involved in creating their own programs and two aimed at general business users.

The two general programs are Text 64 and CUDA 64 and both have been adapted from programs used on other machines. Text 64 is, as its name suggests, a wordprocessor. It's based on SM-Text which was originally developed for the PET, Sirius and Epsom. SM Software claim that if you need more features than Text 64 provides then it's not another piece of software you need but a bigger machine.

It's certainly an excellent word processor for the price (£50). It provides page widths up to 110 columns, a very useful text file handling facility and all the usual facilities that you would expect in a word processing program.

In places it's a little clumsy compared to some of the more expensive packages but we have come across expensive packages which are not as good as Text-64. One area where Text-64 excels is in the use of function keys. Selecting the function keys in some parts of this menu driven program leads to a choice of further 'sub-functions'.

The scrolling facilities are good but do not make up for the rather meagre 40 column screen of the 64 – not too much of a problem for most, perhaps, but for those who use a word processor often it's a definite disadvantage. Working with 80 columns using the Text-64 means that the screen scrolls horizontally when the cursor reaches columns 36, 51 and 66. This can be quite disconcerting because the text jumps suddenly to the left.

The manual leaves something to be desired. It's not as bad as some but it does give the impression that although it's been translated from another language very competently it hasn't been given to a native Englishman (or American or Australian!) to read. The odd little idiosincracy gives the game away. The manual should take more of an educational role. SM Software need to take a look at the Supercript manual. As it stands the Text 64 manual is little more than a list of extra commands and what they mean.

We obviously have not been able to test all the facilities that SM Software claim for Text 64 but it looks like good value for money.

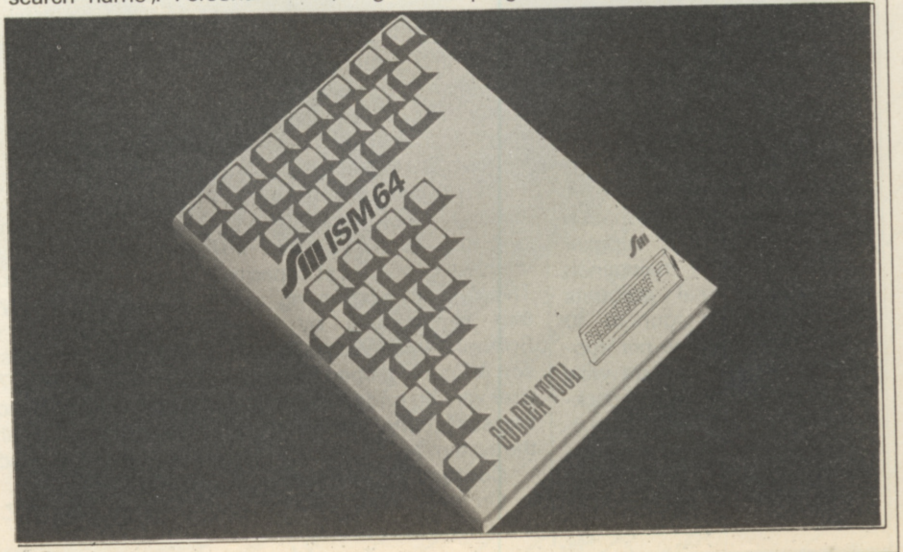
CUDA 64 is an example of a well put together small database management system. Basically it is a card index program for filing names and addresses. It has been adapted from SM-CUDA which formed part of SM-IBIS, a powerful integrated business system for use on the Commodore 8000 and Sirius computers.

There's scope for more than 600 records on each disk and each record holds eight fields. Each record has a number and a keyfield (SM call it a 'search name'). Personal name, organisation name, four lines of address, telephone, telex and several lines of notes can also be entered.

Anyone familiar with DBMS's will see immediately that this is not the most complicated or comprehensive program but it is neat, simple and concise. It is fairly user friendly and will probably be used for small businesses or for personal use. At £40 it is reasonably priced but we did feel that the search facilities are rather restricted.

The next three packages are aimed at serious 64 users. ISM 64, MAE 64 and KIT 64 are all tools or utilities and are obviously intended for use by amateur and professional programmers. ISM 64 is aimed at programmers working in a business where it is necessary to create files while KIT 64 is a toolkit which would be useful for both amateur and professional programmers. MAE 64, however, is for the advanced, probably professional, programmer.

The full name for ISM 64 is Index Sequential Manager and it is described as an advanced file handling system. It is basically a collection of BASIC commands that form a complete disk file management system. It is an impressive program though difficult to handle for



those unfamiliar with programming or files. It consists of a 6502 machine code program which takes up something like 15K of RAM. A useful piece of software but with specialist applications.

KIT 64 has been developed from SM KIT which was developed for the PET series. There are three main facilities: debugging, structuring and testing for BASIC programs; error detection and display; and a facility which enables you to see exactly what is going on in the disk drive. This is another piece of software which obviously is only of use to programmers.

MAE 64 is not, as SM emphasise themselves, any good for beginners. A good knowledge of 6502 assembler language is essential. It is an editor/assembler, the aim of which is to relieve the programmer of many of the chores associated with low level programming.

It is a complicated and powerful piece of software which provides facilities more commonly found on mini or mainframe computers. An advanced machine code monitor is included for program testing and 24 extended commands allow disassembly, load, save and memory moves and so-on. Very useful for the experts.

Series Name: Golden Tool.
Company: SM Software (UK) Ltd.
Address: Raglan House, 56 Long Street, Dursley, Gloucestershire.
Telephone: (0453) 46065.

Name: Text 64.
Description: Word processor program.
Applications: Business and personal word processing.
Documentation: Only adequate.
Minimum Hardware: 64, 1541 or 4040 disk drive, Commodore or ASCII printer.
Features: Good use of function keys and good text file handling capability.
Price: £50.

Name: CUDA 64.
Description: Name and address database.
Applications: Smaller businesses, personal use in larger business or at home.
Documentation: Scant but adequate.
Minimum Hardware: 64, 1541 or 4040 disk drive, Commodore or ASCII printer.
Features: 600 records with eight fields.
Price: £40

Name: ISM 64.
Description: Index Sequential File Manager.
Applications: Business file creation.
Documentation: Reasonable.
Minimum Hardware: 64, 1541 or 4040 disk drive.
Features: See text.
Price: £40.

Name: KIT 64.
Description: Tool kit.
Applications: For programmers using BASIC.
Documentation: Good.
Minimum Hardware: 64,1541 or 4040 disk drive, Commodore or ASCII printer.
Features: See text.
Price: £40.

Name: MAE 64.
Description: **Editor/Assembler.**
Applications: For advanced programmers.
Documentation: Good.
Minimum Hardware: 64, 1541 or 4040 disk drive, 80 column printer.
Features: See text.
Price: £40.

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THE INFORMATION PROCESSOR

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■ One word menu lines for easy selection of facilities.
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■ A 1000 Row by 64 Column wide worksheet with large memory capacity and efficient usage.
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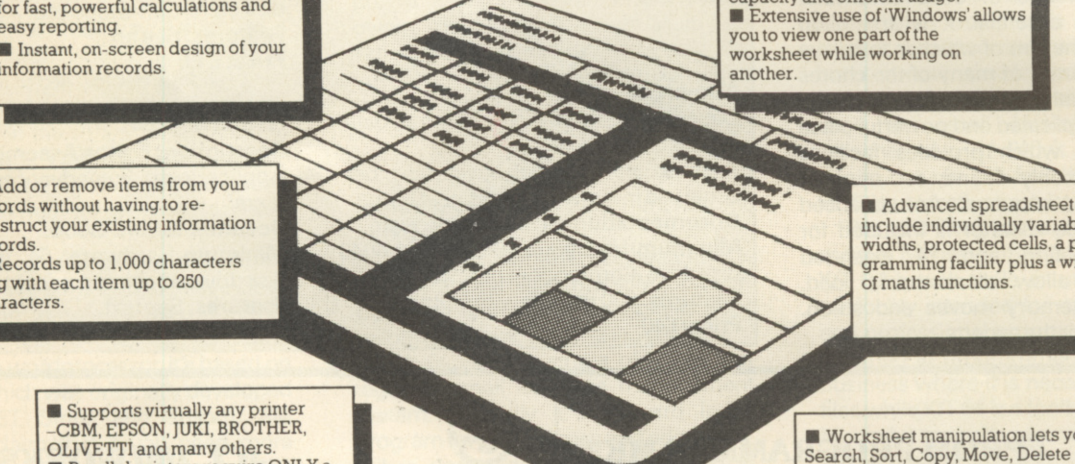

■ Add or remove items from your records without having to re-construct your existing information records.
■ Records up to 1,000 characters long with each item up to 250 characters.

■ Advanced spreadsheet features include individually variable column widths, protected cells, a programming facility plus a wide range of maths functions.

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The information filing capabilities of VizaStar enable you to store your information onto disk in an ordered and instantly retrievable form. This means that you can quickly pick out individual or entire groups of related information to create lists, statements, labels or reports.

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Plotting Fine detail

This month we look at two related products for the business market. Pragma's Printronix 4160 is a plotter suited to scientific and engineering applications and Licom's UPI connects a printer or other peripherals (like the Printronix) to a computer.

Licom's Universal Printer Interface is designed to make simple the connection of a printer and other peripherals, such as a plotter, to a computer. It is aimed at any business involved with word processing, printing and plotting.

This printer interface, which has a 12 month repair or exchange warranty, has a single address IEEE488 input. The address can be anywhere between 0 and 31.

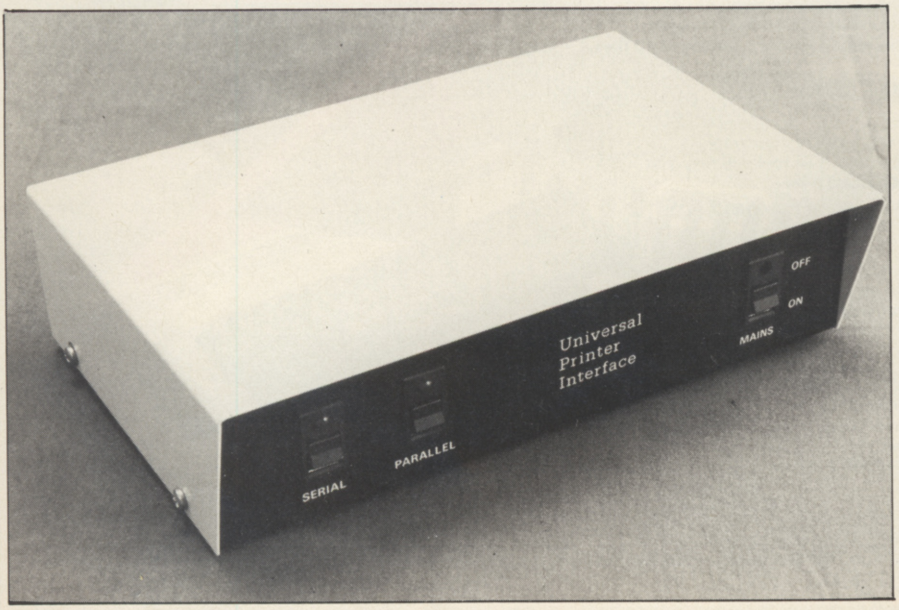
Unlike many printer interfaces, this one from Licom has two forms of output – serial, through the D25 socket, and parallel. Some applications will require that both output ports are in operation simultaneously, for example, the connection of the Universal Printer Interface to a parallel printer or a disk drive and serial plotter.

All of these interfacing sockets are found at the back of the printer. The Centronics interfacing port is not a card edge connector as more commonly associated with the RAM packs, although it is possible to buy an adaptor to convert it. However, it is still possible to select serial or parallel output, or both for simultaneous output.

Two switches control the selection of output. These are situated on the front panel and screen LED indicators show which output is in operation. During operation, output can be switched from printer to printer as required. For instance, in word processing applications it may be necessary to link the interface to a parallel dot matrix printer for internal office documents as well as hooking it up to a serial daisy wheel printer for those items that require letter quality printing.

The transfer of data can be limited to about 100 characters per second regardless of which form of output is being used to allow 'background' printing and maximum baud rate is 9600.

There are two ways to convert PET codes to ASCII. Firstly by opening the printer using 4,4,1 (1 being the secondary address), and secondly by turning the printer interface upside-down to gain access to switches which relate to PET/ASCII conversion. With either method, setting the hardware to convert PET to ASCII is a very simple task.



Product:
Universal Printer Interface
Price:
£225
Features:
Input – Standard addressable IEEE 488 socket
Serial output – standard D25 socket; Subset of RS2 32C protocol
Baud rates – 110, 150, 300, 600, 1200, 2400, 4800 or 9600
Character length – 5, 6, 7 or 8 bits per character
Stop bits – 1, 1.5 or 2
Parity – Even, Odd or None
Parallel output – Standard 'Centronics' D36 socket
Both outputs – data rate can be set to 100 cps to allow 'background' printing with WORDCRAFT
UPI can be set to convert PET codes to true ASCII
Warranty – 12 month repair or exchange on return to Licom
Compatibility
Any micro using IEEE 488 and any printer, disk drive, plotter etc, that uses parallel and serial output
Contact:
Licom Limited, Southdown, Belvedere Road, Coventry CV5 6PF. Telephone 0203 74477

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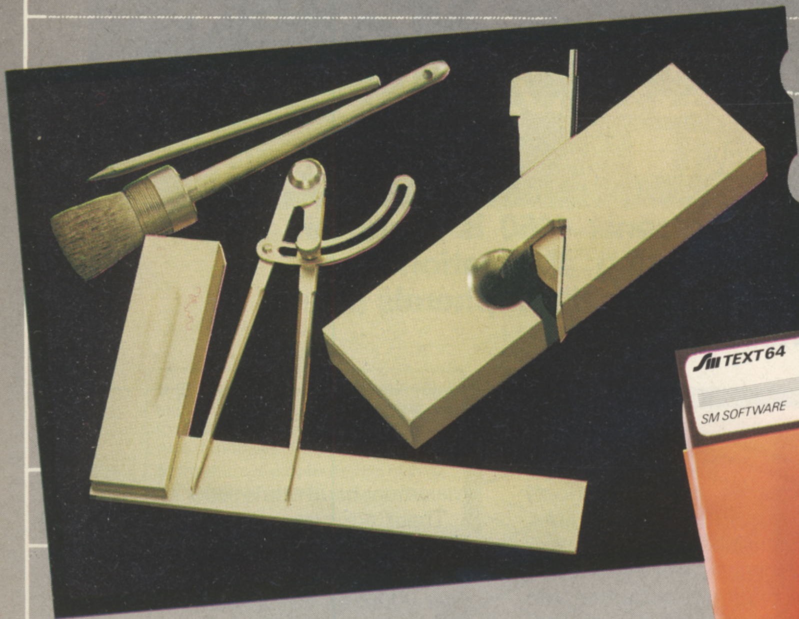

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The definitive tool for the would-be master of the 64. If you are ready for programming in assembler, buy it now. Not for beginners, this tool will help you to fashion masterpieces of the programmer's art. Coexists with Commodore BASIC.

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Prices firm to end 1983

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Part of the SM Software group, supplying international software.

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Simple connections

In the conventional sense, the Printronix 4160 is not a printer/plotter – simply because it is not like most plotters. It does not have a flatbed or a drum, has no pens and can only print in black. Why then, have Pragma chosen to market it as a plotter? The answer is simple, it can plot, but it does so with a bank of 68 hammers mounted on a shuttle. These sweep back and forwards across the paper printing a very high density of dots onto the paper in a graphic or print form – whatever is specified by the controlling program.

The 4160 is especially suitable for scientific and engineering applications. The fine dot diameter combined with the dot density of 160 dots per inch mean that very fine lines and small characters can be produced. Detailed drawings, bar charts etc can be produced very quickly and efficiently, for instance a detailed A-size drawing can be completed in approximately 40 seconds. Two print modes are available. In the character mode, dot patterns specified by ASCII codes in the input buffer are taken from the character generator and sent to the line buffer for character printing. The plot mode uses a similar process, but bypasses the character generator.

It has no 'intelligent' functions, but a warning button on the control panel informs the user on a number basis what is wrong, for example '1' means the paper has run out. In addition if a plot row contains more than 35% block dots it will slow down so that overheating does not occur.

Visually the printer is attractive with its cream compact casing. An acoustic cover reduces the printing noise and the whole printer is surprisingly lightweight.

Product Name:
Printronix 4160
Product:
Plotter/printer
Price:
£4637

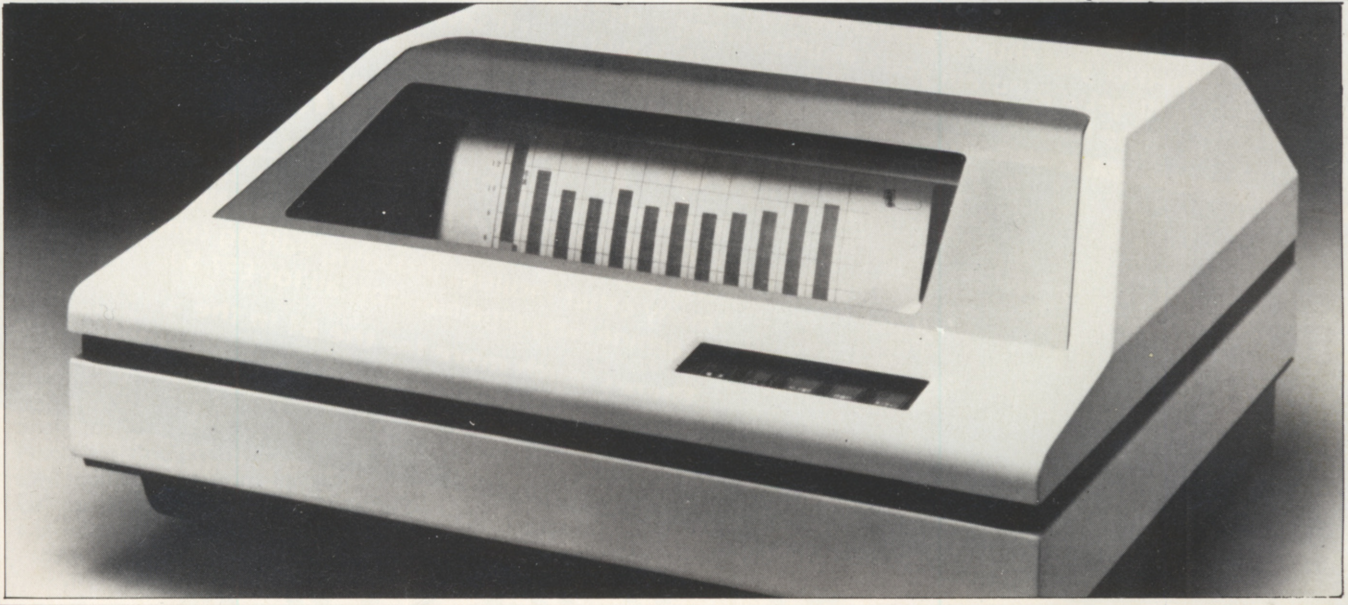
Features:
Shuttle mechanism with 68 hammers
Letter quality print
High resolution printer & plotter function

Print Functions:
Print speed 130 LPM
Plot mode: 2300 dot rows per minute
Bi-directional printing
Print matrix: 11 x 16 upper case & 11 x 20 including true descenders
Character size: 0.07" x 0.1"
Vertical format: 6 or 8 LPM
Character sets: ASCII 96 characters OCR-B
Font standard & up to 160 characters with optional fonts
0.01" dot diameter
Dot resolution 160DPI x 168DPI
Print density of 26,880 dots/in2

Other features:
Black ribbon only
Fanfold paper 3.5 – 16" wide
Tractor feed paper drive
Form feed control TOP (top of form) & PA (paper advance)
Reset control
Alarm control

Size:
10.8"H x 24.4"W x 19.5"D

Weight:
78 lbs
Interface Format:
8 bit parallel, Centronics compatible
Additional:
Interface to convert the CBM 64 & VIC 20
Requirements:
Serial or IEEE ports to Centronics/parallel interface to convert 8000 series IEEE to Centronics
Best option is an interface converting the user port on all micros to Centronics
Applications:
Engineering and Scientific
Contact:
Pragma Ltd, Pragma House, Weirvale Industrial Estate, Denham Way, Rickmansworth, Herts WD3 2RL. Tel: 0923 720326.



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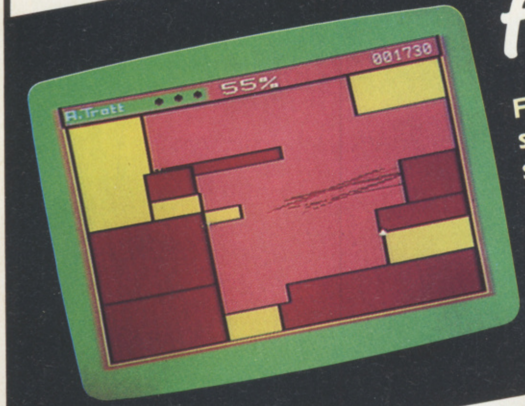

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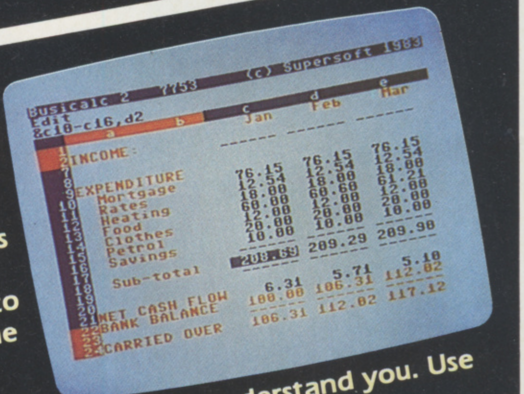

```
                              (c) Supersoft 1983
Busicalc 2     7753
Edit                                            e
&c10-c16,d2                  c        d        Mar
           a          b      Jan      Feb
                           -------  -------  -------
 1
 2INCOME:                   76.15    76.15    76.15
 7                          12.54    12.54    12.54
 8EXPENDITURE               18.00    18.00    18.00
 9  Mortgage                60.00    60.60    61.21
10  Rates                   12.00    12.00    12.00
11  Heating                 20.00    20.00    20.00
12  Food                    10.00    10.00    10.00
13  Clothes                -------  -------  -------
14  Petrol                  208.69   209.29   209.90
15  Savings                -------  -------  -------
16
17   Sub-total               6.31     5.71     5.10
18                          100.00   106.31   112.02
19                         -------  -------  -------
20NET CASH FLOW             106.31   112.02   117.12
21BANK BALANCE
22
23
24CARRIED OVER
```

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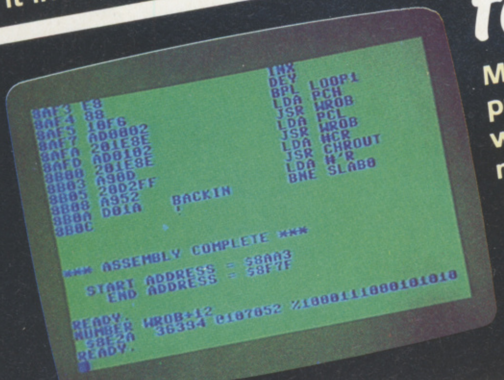
for programmers



```
                              INX
                              DEY   LOOP1
                              BPL   PCH
8AF3 E8                       LDA   WROB
8AF4 88                       JSR   PCL
8AF5 10F6                     LDA   WROB
8AF7 AD0802                   JSR   HCR
8AFA 201E8E                   LDA   CHROUT
8AFD AD0102                   JSR   #'R
8B00 201E8E                   LDA   SLAB0
8B03 A90D                     BNE
8B05 20D2FF
8B08 A952        BACKIN
8B0A D01A        '
8B0C

*** ASSEMBLY COMPLETE ***

  START ADDRESS = $8AA3
    END ADDRESS = $8F7F

READY. WROB+12
NUMBER   36394 @107052 %1000111000101010
 $8E2A
READY.
```

MIKRO is a full 6502/6510 ASSEMBLER with the power that professional programmers need, yet so simple to use that we recommend it to beginners! The MIKRO cartridge has many other facilities including editing commands and a machine language monitor, all for £57.50.

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CBM's Flower-power

Gardening by computer may seem to be one of those applications that's just a little too far fetched to be true. However, down in deepest Sussex they're using Commodore machines to keep everything in the garden (and the bank account) lovely!

Brian and Colin Atkinson with one of the four 64's they use in their nursery business.

Old Barklye Nurseries specialises in selling exotic and everyday houseplants, growing some of their own and importing the rest from all over the world. Not only that, the nurseries can claim some pioneering work in horticulture with their development of a special method of growing poinsettias, preparing them for winter and central heating.

Keeping track of orders, deliveries and invoices was a hard enough task without the extra complications of a maze of freighting and exchange rate problems all of which had to be taken into account before pricing the plants. Brian and Colin Atkinson knew that there must be a computer system somewhere that would help them cope with this headache.

Brian had already experimented with a microcomputer, using a Pet to optimise consumption of energy in the nurseries. He processed data on different tariff rates as an aid to buying the right amount of power a the right rate and time.

Now it was time to become Britain's first fully computerised nursery by introducing microcomputer efficiency into other areas of business administration.

Brian looked at the range of computers open to him, and saw a number of attractive machines between £3,000 and £4,000 that had enough power. But he was not sure that the complex tasks would be handled to his satisfaction.

A leap in the dark for that kind of money was not worth the risk. Instead Brian opted for the Commodore 64, with a number of software packages. After trying out a succession of programs, with which he was not impressed, he finally found what he was looking for in PractiCalc, Computer Software Associates' spreadsheet from Ipswich-based UK distributors, Marketing Micro Software Ltd.

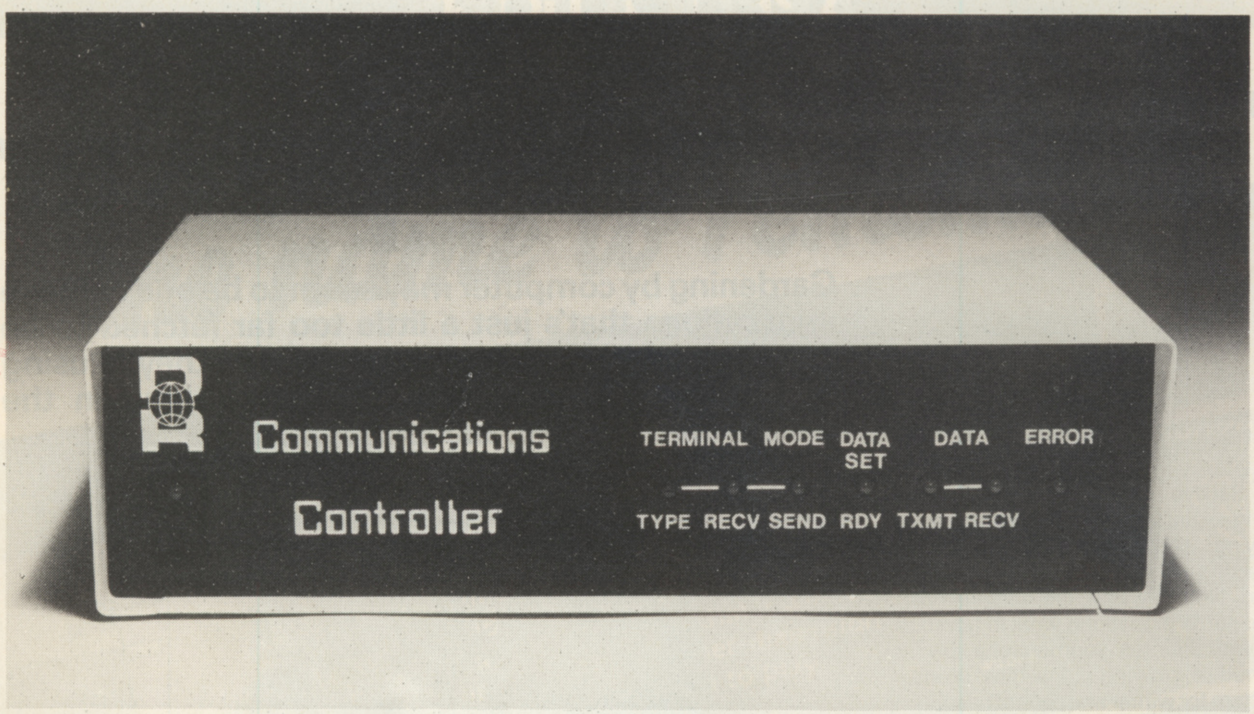
"We looked at a lot of spreadsheets," says Brian. "Since most cost over £100 you have to make the right choice, especially with a staff that isn't used to computers. They all looked fine in principle, but very complicated and daunting to actually put into practice, until I came across a review of PractiCalc and sent off for a copy."

In fact Brian was so taken with the 64 that he now has four Commodores doing different jobs around the nurseries.

On one micro he uses PractiCalc to estimate and prepare price lists, taking into account exchange rates, discounts, freight costs and so on, and on another the program is used for a complicated entry system on orders. Then he has one machine purely for staff 'acclimatisation', and the fourth he is using to take over from the Commodore Pet on his unique energy control system.

Available on disc and cassette for the Commodore 64 at under half the price of most spreadsheets, PractiCalc offers a full four colour, clear on-screen display and performs a number of unique and sophisticated functions not usually found in this price range. For example it has a 'seek and search' facility for the whole or parts of the spreadsheet, a choice of alphabetical or numeric 'sort' from highest to lowest or vice versa, a wide range of over 20 maths functions and a versatile graphics facility. With a great deal of complicated data to process, Brian Atkinson and his staff find the range of sorting options and the system's fast 'go to' function particularly useful.

"The use this program has been put to has been quite amazing. It has repaid the original cost very many times over," he commented. Because it is easy to use, PractiCalc has caused few problems. Beginners questions were efficiently answered by Marketing Micro Software who offered a 'first class service'.



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Send it down the line

Many people now use their personal computers to communicate, through a modem, with bulletin board systems, information services, mainframe computers and other personal computers. Speculative films like Wargames are becoming reality as computer whizz kids rob banks, obtain access to highly sensitive government information and generally prove that anything is possible in Telecommunications. This month Commodore Computing International provides a buyers guide to modems, explaining modem terminology and listing a selection of Commodore-compatible modems.

What exactly does a modem do? Think of a conversation between a French and an English man. Neither will even attempt to speak the others 'foreign' language, but in this example it is essential that they communicate. What can they do? The only short term solution is to introduce an interpreter willing to translate the conversation for both men. This situation is analagous to the computer, telephone line and the modem, the modem being the interpreter converting the computers language into one familiar to the telephone.

'Modem' is actually a shortened version of the two words describing its function: MOdulator and DEModulator. The computer uses a binary signal system and the telephone lines use and comprehend audio-frequency signals. In the first part of the process – modulation – the computers binary signals are converted to the analogue signals understood by the telephone lines, sounds rather than digital pulses. In the opposite process – demodulation – the telephones' audio signals are converted into the electrical impulses of the computer.

Modems can be connected to the telephone system either by direct electrical connection or by acoustic coupling. The acoustic coupler has the advantage of being cheaper, electrically isolated and easier to connect, but it is affected by background noise which can corrupt incoming and outgoing data. It has a cradle and two rubber cups to accommodate the handset. In one cup the loudspeaker generates an audio tone and passes it along the telephone line. Signals are received by the microphone in the coupler and changed into binary pulses for the computers comprehension.

The other type of connection is a two or four hardwire connection which uses a socket installed by British Telecom.

Connecting the modem to the General Switched Telephone Network (GSTN) can be expensive if used frequently because the user pays at the same rate as private telephone calls. Some of the modems can be connected to leased lines – private lines rented out by British Telecom, and these are cheaper to run.

How does the system work? To pass a message from your computer, the micro has to send a character to the modem interface. The modem acts as a terminal. The computer at the other end – massive central computer or another home computer – may not recognise the characters and codes that your own micro uses and will need to be told how to deal with any special system, such as Prestel. Software provides the instructions the computer needs to act as a terminal.

A cable is needed to link the modem to the computer. Most modems use an RS232C or RS423 interface but unfortunately for Commodore users, neither the 64 or VIC-20 deliver the correct signal, so the RS232 signal has to be buffered or inverted. Bear these additional requirements in mind when considering the purchase of a modem because they could cost more than the modem itself.

Modems are rated according to the speed in which they receive and send data. Speed is usually described as 'bits per second' (bps) or baud rate. Modems at each end of a system must send and receive data at the same speed otherwise they can not communicate. Standards have emerged and three of the most common ones in use are as follows: The 300/300, where both micros transmit and receive at 300 bps; 1200/75 bps, with the host transmitting at 1200 bps and the user terminal transmitting at 75 bps, and similarly the 75/1200 where the host transmits at 75 bps and the user transmits at 1200 bps. (Both these speeds are utilised by Prestel and Viewdata.) Finally the 1200/1200 where both transmit and receive at 1200 bps.

Some of the more sophisticated models can transmit in all these speeds. Modems can transmit data at up to 19200 bps depending on the distance over which the data is transmitted, but these are not generally for home use. Check what speed the modem of the system you intend to use runs at before investing.

Two different audio tones are used when computers communicate with each other. The sender, who is usually in originate mode, transmits at 980 or 1180 Hz and the receiver, usually in answer mode, transmits in 650 or 1850 Hz. This ensures that the modem doesn't start receiving its own transmissions. The main physical difference between the two modes is that in answer mode the modem speaks with a steady tone known as a carrier and the other modem will wait to hear the carrier before replying with its own carrier tone.

Two modems cannot communicate if they are both in answer or in originate mode. Most of the central or host computers are in answer mode to receive calls from subscribers, so the terminal end should be in the originate mode. A modem capable of switching between the two modes would be the best option.

Another consideration when choos-

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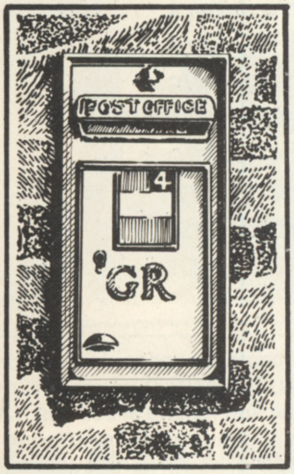

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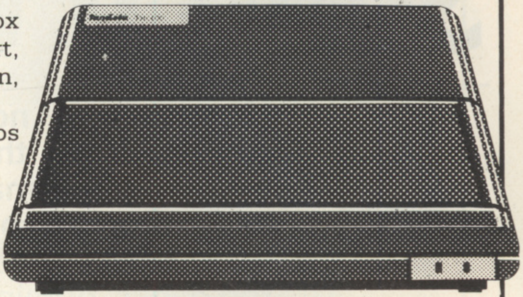

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ing modems is whether they are duplex or only half duplex. In half duplex mode the system will only allow one computer to talk at any one time. This is fine unless you suddenly realise that the wrong instructions have been given and you are getting details of the Dow Jones Index rather than information on trekking through the Himalayas. The user would have to wait until the computer had finished and then renew the instructions. Full duplex means that it would be possible to communicate with the other end and tell the computer to stop, like a telephone conversation (also more expensive).

Computers process information at a much greater speed than the modem. Those that have been synchronised to the computers clock pulse allow much faster data transfer. Otherwise the modem is asynchronous and contains a store which keeps computer generated data for processing at its own slower pace.

Many of the more recent modems, in the cheaper as well as the more expensive price bracket, have 'luxury' features incorporated into them. These make the operators life much easier. Dialling an engaged number fifty times isn't much fun! Originally the user had to dial the number of another computer, listen for the carrier, pass the carrier to the modem, identify himself and then 'log on'. Facilities available include the auto answer function which answers the phone and prepares to receive instructions without need for any human assistance. Useful when running a local network or calling your computer from a remote location. The auto dial facility is self explanatory and auto recall will try to contact any unobtainable numbers. Some modems have a menu of alternative numbers and can store ID numbers and passwords necessary for access into the networks.

Intelligent is a word increasingly used to describe some of the modems. This doesn't mean that they are rational machines with IQ's of genius proportions, but that they contain microprocessors designed to select different speeds automatically. The modem interface can be set to most of the standard speeds which enable it to work in networks supporting both local and dial-up terminals such as Viewdata.

A very useful facility in some of the modems, especially for non technical users, is a self testing function. One of the methods of achieving this is a loop back system that checks the signals and corrects them. As often as not, the telephone lines are at fault and line noise – clicks and bangs – could sabotage the signal conversion process. The error detection and correction scheme checks all incoming data and automatically changes or eliminates any offending material.

Kits are available which provide all the necessary parts needed to make a modem. However unless you are experienced with building integrated circuits and soldering tiny heat sensitive parts onto a circuit board it is probably wiser to spend that little bit extra on an assembled modem.

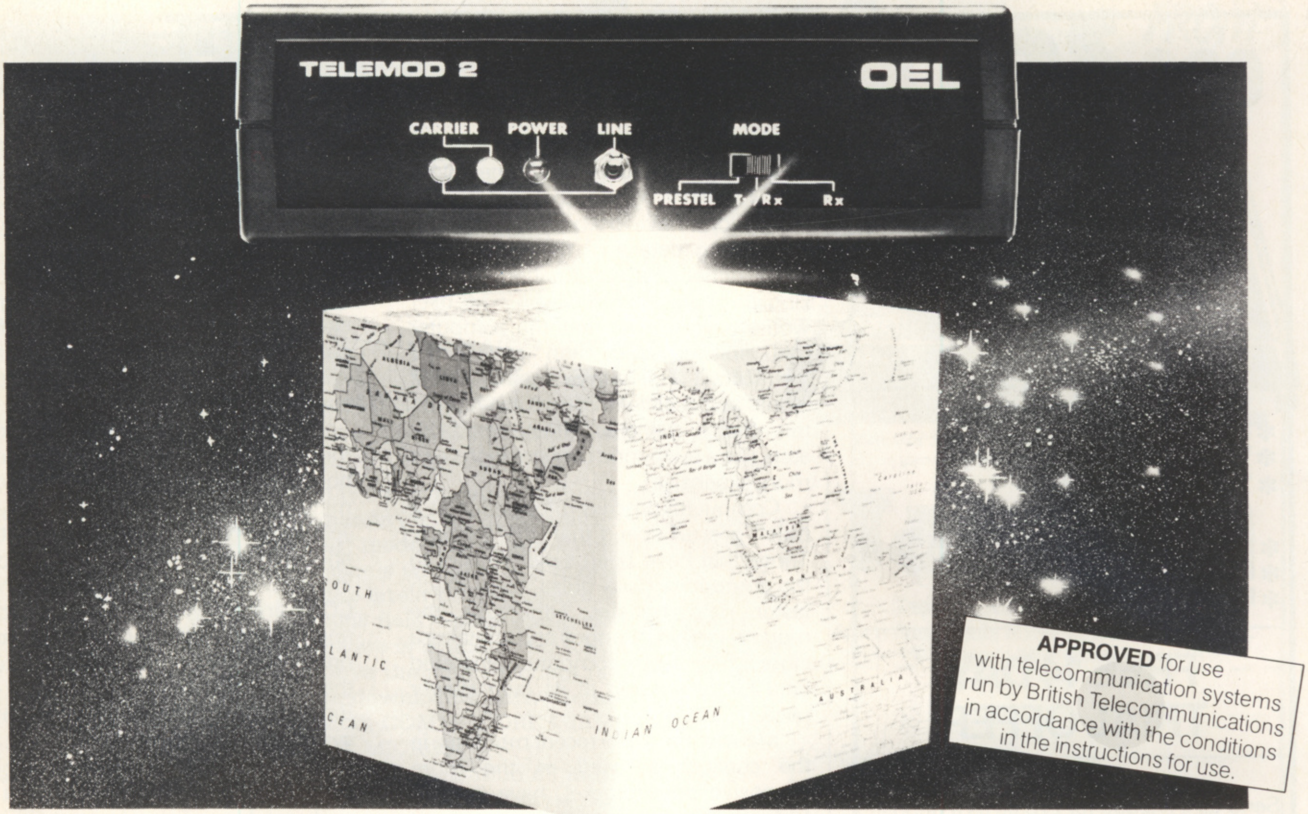
Potential buyers should check that their modems conform to recommendations specified by the Consultive Committee on International Telegraphy and Telephony (CCITT), a body set up to set and maintain standards in the modem industry. All modems conforming to CCITT criterion will be interconnectable and networks all over the world could potentially link up with the exception of the USA which has its own system – the Bell which does not work with European systems.

A green sticker is a sign of approval from British Telecom who check that each modem conforms to their safety standards. Incorrect signals on the lines could be very dangerous and the transmitted frequency of acoustic couplers must not be higher than the human voice (3kHz). All the modems we have mentioned have the approval of British Telecom. Hard wired modems must be fitted by BT and any home made device must be checked to ensure that it is not a hazard to either the user or the network.

Another consideration that should be taken into account is a company's reputation for reliability. If there is no chance of asking an existing user about their experiences with a modem, then a guarantee for after sales customer service should be sought. Modems can go wrong and technical support will be essential.

Telecommunications is beginning to be much more widely understood and utilised by the consumer as well as by the business person. There is no doubt that they expand the scope of a home computer and the potential of the modem in business is staggering. Services available include home banking, Micronet 80, Tele-shopping, Citiservice, Viewfax 258, Electronic Mailing System.

Our list of modems is by no means exhaustive, but we hope it serves as a guide to what is available on the market. If you need more information about a specific modem, contact the relevant manufacturer. Tandata produce a useful leaflet on Modems which is obtainable on request.



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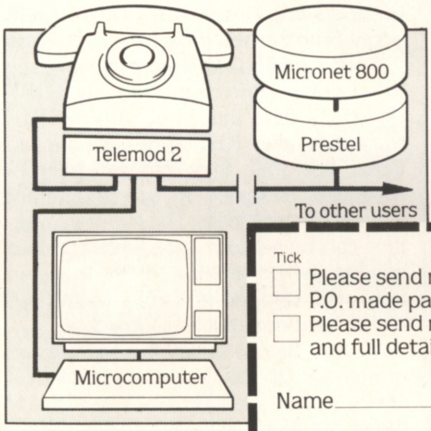

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Manufacturer	Anderson Jacobson	Anderson Jacobson	Anderson Jacobson	Case	Case	Case	Case	DaCom Systems Ltd	DaCom Systems Ltd
CCITT Standard	V.21	V.21	V.21	V.21/V.23	V.24/V.28 RS 232 C	V.23	V.27	V.21	V.21/V.23
Coupling Method	acoustic	direct/ acoustic	acoustic	direct	direct	direct	direct	direct	direct
Baud Rate	300	300	300	300, 1200/75 1200/1200	300, 600 1200	1200, 75/ 1200	4800	300	300; 75/1200; 1200/75; 1200
Duplexing	half/full	half/full	half/full.	half/full	full	half/full	half/full	full	half/full
Data Format	originate asynchronous	originate asynchronous	originate/ answer	originate/ answer asynchronous	synchronous asynchronous	asynchronous	synchronous	answer/ originate	asynchronous
Auto Answer	no	no	no	yes	yes	yes	yes	yes	yes
Auto Dial	no	no	no	yes	yes	yes	yes	yes	yes
Self Test	no	no	no	yes	yes	yes	yes	yes	yes
Power Supply	190-250 V	190-250 V	115-230 V	240 V	198-240 V	220-240 V	230 V	PP3 batteries/ mains adaptor	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	—	1 year
Other	—	—	—	rackmount	rackmount Bell compatible	—	rackmount	—	rackmount
Price (£)	229	279	279	295	625	695	1700	79.95	268

MODEM	KN 803	Portman	Mini LDS 122	LDM 414/ RM 3414	LDM 404/ RM 3404	3300 V.21	SR202	4801 MP	9620/V.29
Manufacturer	Duplex Communications	Duplex Communications	Gandalf	Gandalf	Gandalf	IAL	IAL	IAL	IAL
CCITT Standard	V.21/V.23	V.21/V.23	V.24/V.28	V.24/V.28 RS 232 C	V.24/V.28 RS 232 C	V.21	V.24/V.28	V.27 bis/ter	V.24; V.28 V.29
Coupling Method	acoustic	direct	direct	direct	direct	direct	direct	direct	direct
Baud Rate	300	300; 1200/75; 75/2000; 1200; Bell 103/202	50-9600	2400; 4800	4800	300	2400; 4800; 9600; 19.2k	2,400; 4,800	9600/4800; 7200/4800
Duplexing	half/full	half/full	full	full	full	half/full	half/full	half/full	half/full
Data Format	originate	originate	asynchronous	synchronous	asynchronous	asynchronous	synchronous	synchronous	—
Auto Answer	yes	yes	no	no	no	yes	no	yes	yes
Auto Dial	yes	yes	no	no	no	no	no	no	no
Self Test	yes	yes	no	yes	yes	yes	yes	yes	yes
Power Supply	mains/battery	190-225 V	host	240 V	115 V	240 V	240 V	240 V	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	4 versions available	Bell compatible rackmount	7 Km range	80-250km range RM3414 is rackmount version	80Km range RM3404 is rackmount version	auto fallback	rackmount range up to 10 miles	auto fallback microprocessor changes speed	auto fallback rackmount
Price (£)	250	—	—	—	—	330	520	995	1485

BUYERS GUIDE

MODEM	Modem Kit	Linemaster	MS 2123	3001A	Interfibre FD 192	Interdriver LD 968	M321L	M1223	Telemod 2
Manufacturer	Maplin	Master Systems	Master Systems	Modular Technology	Modular Technology	Modular Technology	Modular Technology	Modular Technology	O E Ltd
CCITT Standard	—	n/a	V.21/V.23	V.21	V.24/V.28	V.24 RS 232 C	V.21	V.23	V.23
Coupling Method	direct	direct	direct	acoustic	direct	direct	direct	direct	direct
Baud Rate	300	up to 9,600	300; 75/1200; 1200; 75; 1200	300	up to 19,200	up to 9,600	300	1200	1200/75; 1200
Duplexing	half/full	full	half/full	half	—	half/full	full	half/full	full
Data Format	answer/ originate	synchronous/ asynchronous	asynchronous	answer	synchronous asynchronous	synchronous	asynchronous answer/ originate	synchronous/ asynchronous answer/ originate	asynchronous
Auto Answer	yes	no	yes	no	no	no	yes	yes	no
Auto Dial	no	no	yes	no	no	no	yes	yes	no
Self Test	yes	no	yes	no	yes	yes	yes	yes	yes
Power Supply	240 V	240 V	240 V	240 V	9 V	190-260 V	190-265	190-265	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	—	in house use only	Bell compatible – cable 4 or 8	—	—	range up to 5 Km	—	—	—
Price (£)	39.95	250	235	149	149	240	185	190	84.95

MODEM	Buzzbox	2123 GT	TM 100	TM 200	micro SRM-6	DM 321 D	DM 540	DM 2426 D	DS 2857
Manufacturer	Scicon	Scicon	Tandata	Tandata	Tech-Nel	Tech-Nel	Tech-Nel	Tech-Nel	Timeplex
CCITT Standard	V.21	V.21/V.23	V.23	V.23	V.24	V.21	V.24/V.28	V.26	V.24/V.28
Coupling Method	direct	direct	direct	direct	direct	direct	direct	direct	direct
Baud Rate	300	300; 1200/75; 75/1200; 1200	1200/75	300; 1200/75; 1200/75; 1200	up to 19,200	300	600-19,200	1200; 2400	600-19,200
Duplexing	full	half/full	full	half/full	full	full	half/full	half/full	full
Data Format	answer/ originate	answer/ originate		answer/ originate	asynchronous	answer/ originate asynchronous	answer/ originate synchronous/ asynchronous	synchronous	synchronous/ asynchronous
Auto Answer	no	yes	yes	yes	no	no	no	no	no
Auto Dial	no	yes	yes	yes	no	no	no	no	no
Self Test	no	yes	yes	yes	no	no	no	no	yes
Power Supply	batteries mains	240 V	240 V	240 V	batteries mains	190-265 V	100-125 V/ 200-250 V	190-265 V	220 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	pocket-sized	microprocessor converts speed	auto recall stores 8 ID numbers or passwords	auto recall stores 8 ID numbers or passwords	5 Km range	—	rackmount	rackmount	25 Km range
Price (£)	69.50	498	86	217	pair – 99	327	425	499	315

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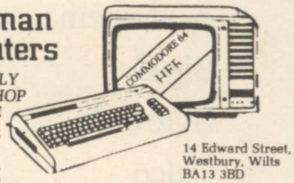

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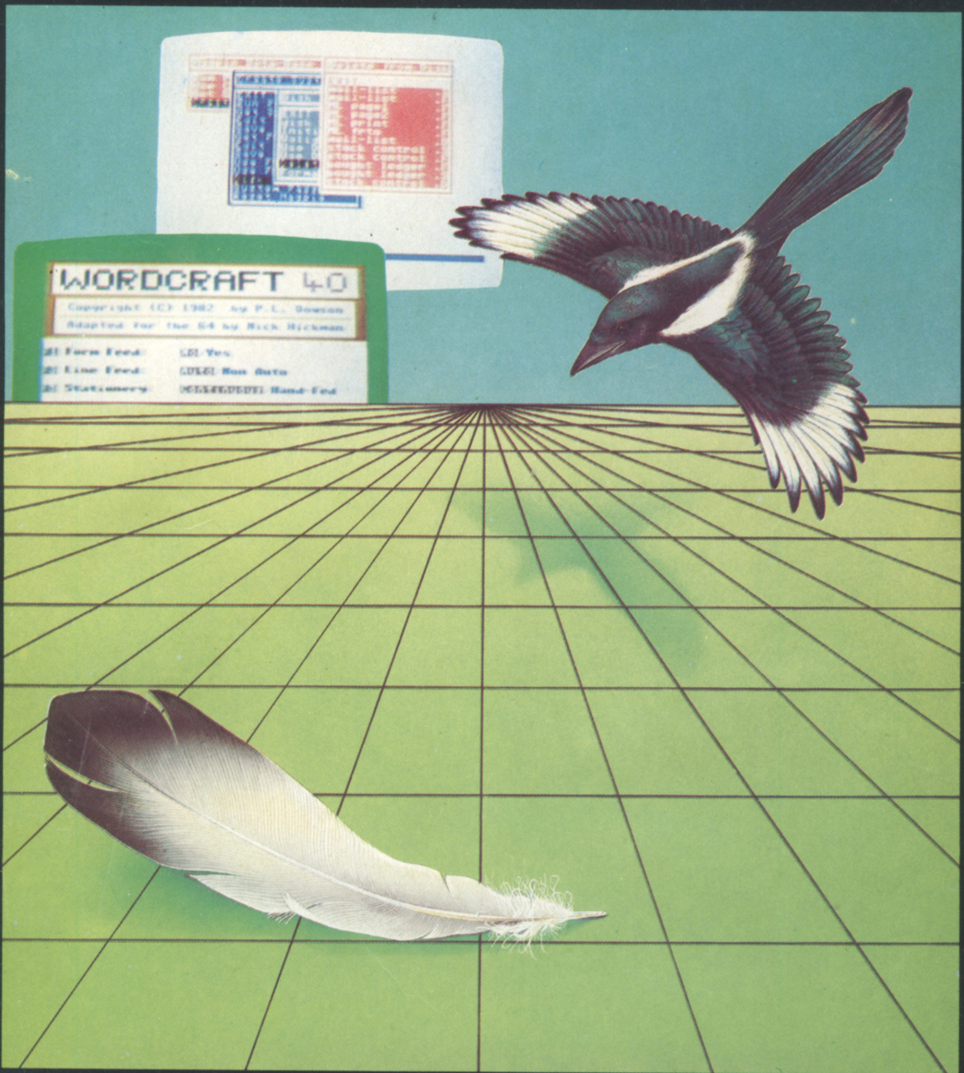
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